PROCEEDINGS

of the

ENTOMOLOGICAL SOCIETY *of* BRITISH COLUMBIA

Volume 45. Issued July 28, 1949

PAGE

CAMPBELL, as Presented by SPENCER—Notes on *Grylloblatta* at Kamloops 1

JONES—An Experiment with Larvae of *Lambdina fiscellaria somniaria* Hulst. 6

HOLLAND—A Revised Check List of the Fleas of B.C. 7

GREGSON—Notes on the Occurrence of *Ornithodoros hermsi* in B.C., and its Probable Relation to Relapsing Fever 15

HOPPING—Parasitic Coleoptera 16

HARDY—Notes on the Life History of *Xanthorhoe defensaria* Gn. 17

CLARK—An Annotated List of the Coleoptera Taken at or near Terrace, B.C. Part 2 21

LEECH—The Occurrence of a Hollyhock-Seed Eater, *Noctuelia rufofascialis* at Vernon, B.C. 25

BUCKELL—Record of Bees from B.C. (Andrenidae) 27

CURTIS—The Effect of DDT Emulsions on Trout Fry 31

IN MEMORIAM—L. E. Marmont 32

SCIENTIFIC NOTES 14, 20, 26, 30

NEW LITERATURE 26

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NEW LITERATURE 26

NOTES ON GRYLLOBLATTA AT KAMLOOPS

By the late MATTHEW GEDDES CAMPBELL, presented by G. J. SPENCER
University of British Columbia, Vancouver, B.C.

In the autumn of 1938 it was my good fortune to get into correspondence with Mr. M. G. Campbell who worked in the post office at Kamloops. Mr. J. D. Gregson of the Dominion Entomological Laboratory had told me that Campbell was a keen amateur entomologist who had become interested in *Grylloblatta*, which Gregson had recently found at the foot of Mount Paul, Kamloops, so I wrote to him in connection with this insect. For one reason and another, the correspondence lapsed until September, 1940, when Campbell happened to listen to a broadcast in which I had mentioned *Grylloblatta*, and wrote again, this time from New Westminster where he had been transferred for over a year. A letter came from him on October 7th and in the evening paper of that day, appeared a notice of his death. The notice read: "New Westminster, Oct. 7.—Fatally injured in a traffic accident shortly after midnight Saturday at Sixth Street and Eighth Avenue, Matthew Geddes Campbell, 47, postal clerk, of 1009 Fourteenth Ave., Burnaby, died in the Royal Columbian Hospital at 6:55 a.m. Sunday."

Shortly afterwards I wrote to his widow concerning his observations and notes on *Grylloblatta*, but received no reply; I wrote again in autumn 1947 to the same address, and since there has been no answer, it is possible that Mrs. Campbell has moved elsewhere. Because his letters to me in 1938 contained interesting records on *Grylloblatta*, I feel that they should be published, especially since he gave me permission to do so. From his correspondence I have picked out sections to make a fairly consecutive narrative, with a little editing.

"Last Sunday (6 Nov. 1938) I was successful in capturing a number of *Grylloblatta campodeiformis* on the slopes of Mount St. Paul and brought them home alive. (The bottom edge of Mount St. Paul, Kamloops, where *Grylloblatta* occurs, is only about 1,400 ft. above sea level. G. J. S.) I have prepared a case for them and will ship them to you. . . . As you know, these insects are very susceptible to changes of climate and can live only between 30°F. and 40°F. . . . There are 15 or 20 specimens. I had about 25 originally but some may have been killed or injured by larger ones or by jolting on the way over. A friend of mine, Mr. Consett Davis of the University of Sydney, Australia, who is at present studying at the University of California, Berkeley, will be returning to Australia on the 'Niagara' leaving about 20 Dec. I promised him some time ago that I would try to get him some live *Grylloblatta*, so if you do not mind taking care of them until his arrival, I would suggest that you divide them equally.—There is a bare possibility that Mr. Davis may have time to come up here but we may get a cold spell and then *Grylloblatta* goes away down under tons of rock and is difficult to find. Snow or zero weather may drive them down before I can make another raid. If they reach you in good condition, I would suggest that you keep them in soft rotted humus, between 30°F. and 40°F. They will freeze at about 26°F.

(19 Nov. 1938). "I was much relieved on receiving your letter of 16th inst., to know that the *Grylloblatta* arrived safely. I probably shot them at you rather suddenly and it requires a little preparation to receive such guests properly. . . . I intend to go out tomorrow (Sunday) afternoon. . . . . Mr. Davis will be in Montreal for a few days before the 28th Nov. and I am planning to send him two lots, one by express and one by air mail. I understand that they can keep them at about the right temperature on the fish rack in the express cars. . . . I have a batch in my basement that I can send Mr. Davis if I am unsuccessful in my hunt

tomorrow. Usually I go out hunting in the morning but for your purpose (to examine the stomach contents soon after a meal) it will be better if I catch one in the evening and send it on the night train. . . . no use examining the gut of those two large females I sent you because one or other devoured a good big male nearly as large as they are, just before I sent them off."

(21 Nov. 1938). "I am sending to you by this mail, two specimens of *Grylloblatta* which I caught about 10 a.m. this morning and killed in 70% alcohol. . . they are not quite as big as I would have liked. . . . . Had a busy morning and caught about 25 though they were mostly small. About 20 of these, I am sending off tonight by air mail, special delivery to Mr. Davis at Montreal. It is a long chance but worth the risk. I could not go out on Sunday as planned; the train wreck delayed me at my work but I made good this morning. Mr. Gregson and three others were out Saturday afternoon but drew a complete blank. I still have a number of specimens on hand."

(5 Dec. 1938). "I have handed my remaining specimens over to Gregson. . . . as I work in the post office I will be very busy for the next two or three weeks. . . Mr. Davis sent me word from Montreal that he had received the batch I sent him. Some perished on the trip and not relishing the responsibility of looking after them on an 18,000 mile trip, he "dunked" the lot in Carnoy's fixative. (The Shirker).

"As you know, I am very interested in this strange insect and have collected quite a file (of notes) on him. Last winter I kept a number in captivity, some of which died and were pickled and sent to Davis. Gregson also kept a few but I understand they too died when the weather became hot. Therefore I hope you will not mind my offering some suggestions from the experience I gained last winter. I have made many trips to Mount St. Paul and must have collected more than a hundred specimens. . . . I trust you will find my observations of some value. . . . You are quite at liberty to use or quote any of this (material) you wish. It is merely my hobby, something I play at and I have had a lot of fun and interest out of *Grylloblatta* and expect (to have) lots more.

"A great deal of sheer bunk has been written about this poor creature. I am thinking of a picture of him that appeared in an Alberta paper, showing the insect on a block of ice and stating that if removed from the ice he would have convulsions and die in a few hours. Some I caught early last March survived until the end of June with never a bit of ice, just in a glass biscuit jar in my basement. I had difficulty in persuading even Gregson that they would perish if exposed to five or six degrees of frost, at the same time as the newspapers were making quite a song about the poor things 'roasting' to death in a refrigerator. I lost all of a dozen specimens before the truth dawned on me. Or, as I explained to Davis, it does NOT need to be cold enough to freeze the appendages of a brazen simian, in order to suit *Grylloblatta*. Altogether too much has been made of this temperature angle, ever since he was badly misnamed 'Ice Bug,' A 'Rock Louse' would be a much more appropriate term. Give them lots of well-rotted humus to prowl in, a few rocks to hide under and you will have no more trouble with them than with a bunch of earthworms. Here (in Kamloops), we have sub-zero temperatures to protect them from as well as temperatures over the century mark, but down there (in Vancouver), with the exception of a little ice in July and August, they should live in your normal, outside, temperatures. Mine were alive and active when the thermometer on the verandah showed 75°F., but the temperature in the basement [where they were kept. (G.J.S.)] was about 60°F. I am convinced that if they had had more humus to protect them, they would have survived [all summer. (G.J.S.)]. I did not give them more humus because I could not then have observed their reactions.

"I will put the remainder of this on

separate sheets so that you can file, or refer to them apart from this letter."

Mr. Campbell's "NOTES ON GRYLLOBLATTA" (Transcribed with a few changes, and translocations of sentences, by G. J. Spencer).

ON HABITS OF GRYLLOBLATTA.—

"Since most of the work hitherto done on this insect has been of a laboratory nature, and as I have no equipped laboratory, I have concentrated more on his habitat and plant and insect associations. Much may be learned about him from a study of his extraordinary habitat. Here (in Kamloops), he occupies a range of rock slides about a mile in length and I have found *Grylloblatta* all along these slides from one end to the other; amongst large boulders so big as to require a crowbar to turn them over and amongst gravel the size of a small pea. Generally speaking, the large ones are found amongst the large rocks and small ones amongst the small rocks but I find it more convenient to divide his habitat into three zones.

A. "The front part or edge of the slide (farthest from the talus slope), where vegetation begins amongst the large, loose, scattered boulders. This is where the large, amber-coloured adults are to be found. Sage brush is here the dominant plant (*Artemisia tridentata*) and sage seeds are scattered all through the humus (duff). Here also occur several species of grasses, Saskatoon bushes (*Amelanchier*), Oregon grape (*Berberis* prob. *nervosa*) and an occasional Jack pine (yellow pine, *Pinus ponderosa*).

B. "Area about one foot in from the edge of the slide where winds have blown in a light covering of leaves and humus (has formed amongst the rocks). This is the home of the medium-sized, grey ones and, in springtime, of white (nymphs in) early instars.

C. "In area deeper down amongst the older, deeper humus, are found little white nymphs of early instars.

"When disturbed, *Grylloblatta* always goes UPWARDS, that is, towards the mountain, further into the shelter of the rocks. Even when trapped with a spoon, they will not turn outwards but will climb over the spoon in their attempts to get into the shelter of the hill.

"After searching in one place for a little time, even though several specimens may have been found there, further search is generally fruitless; the disturbance caused by moving rocks, alarms them and they scatter deeper into the hill. Here I quote Dr. Norma Ford: 'The next morning I *expected* to take at least forty specimens, and literally no stone was left unturned in the swampy ground as I worked in ever increasing circles from the point of the first capture. But not a specimen was found.' Dr. Ford seemed to obtain hers in boggy, wet soil; most of my captures have been made under conditions of drizzly 'Scotch mist.'

"This autumn I was due for another surprise. Thinking that I was really clever, I decided that since the summer had been very dry, *Grylloblatta* would be found in the little gullies that run down from the tops of the cliffs where water would trickle down and settle (in temporary low spots). Strangely enough I had no luck in these places, but found him away out on 'bone dry' spurs under exceedingly dry, dusty conditions. Moreover, while prowling over the hills on the west side of the North Thompson river in the spring (of 1938) I found one specimen, about two miles west of Mount St. Paul and on the other side of the river. [Note: this would be on the east slope of the Batchelor hills which drop abruptly to the North Thompson Valley; there is little or no talus on these hills which are extremely dry. (G.J.S.)]. However, I was foolish enough to put him into a can with a large silver fish [Machilidae (G.J.S.)] and when I got home there was only one very fat silver fish. I never found him in a high, either hot or cold wind, nor when the thermometer was above 50°F. although I have found him when it was as low as 15° or

20°F., buried in a deep bed of humus. That was cold hunting.

"That he can survive and get along nicely when temperatures are below zero, (as sometimes happens at Kamloops), does not surprise me much. An inch or two of snow and a few inches of humus give him all the protection he needs.

"But where does he go in summer, when there isn't a drop of rain for months and the rocks at the foot of the talus slope sizzle in temperatures up to 120°F. for 12 or 14 hours a day? He must have certain selected places deep down, covered with two or three feet of rock, with a layer of humus available and a means of retaining moisture. That he goes into a sort of dormant state (aestivation) in summer, I have no doubt.

"Of the insects that occur in the *Grylloblatta* association (may be mention), a small green fly; the aeroplane moth that folds itself up to look like a monoplane or like a cross of two pieces of dry stick [Pterophoridae. (G.J.S.)]; a few centipedes, an occasional nest of termites [*Reticulitermes hesperus* (G.J.S.)], the occasional silver fish and several species of spiders. I have not seen any true ants in his direct neighborhood but in the autumn, plenty of grasshoppers, wasps and bees crawl amongst the rocks for shelter from the cold nights. While adult *Grylloblatta* are out hunting grasshoppers stiffened by cold, the large, swift-moving spiders are in turn, hunting *Grylloblatta*; spiders are really the most dangerous enemies of adult *Grylloblatta* until the weather gets too cold even for them. . . . Full-grown, adult *Grylloblatta* are distinctly carnivorous, and are fiercely combative prowlers and hunters . . . although the earlier stages *may* eat decaying vegetable matter . . . as of moss and other primitive plants . . . However there is hardly any moss on Mount St. Paul and I have not noticed any where *Grylloblatta* is found; higher up the mountain where there is some moss, I have never found him.

"We know that even medium-sized ones will devour grasshoppers, wasps, bees and cockroaches. I tried some ants on them and also ant pupae but *Grylloblatta* was not interested after the first smell. (However) on several occasions I have found adults (apparently) waiting at the top of a burrow of termites. Whenever I found a termite run I would turn over a couple of rocks above it and usually found one or two *Grylloblatta*. Although Dr. Ford claims she found three adults under one flat stone, I have rarely found more than one at a time.

"I wish I could get over to the mountain about this season (6 December). After devouring all the frozen (autumn) insects, *Grylloblatta* will undoubtedly go on to reproduction. I feel sure that in this locality, this is his mating season."

CARE OF GRYLLOBLATTA IN CAPTIVITY.

"My temperature records are not in any sense scientific, but I did observe (the creature) under many and varied conditions, summer and winter, in captivity and in his (natural) habitat. . . . I feel certain that a study of his life would add much to biology. How I regret now the opportunities I passed up of qualifying myself to make such a study. . . I do not see how I, an untrained man, can add much to the work that has been done by Drs. Walker and Mills and Pepper. However, if anything I can do will benefit science in the smallest degree, you are more than welcome to it.

" . . . In simulating natural temperature conditions here (in Kamloops) the range would approximate: October to April, day 80°F. to 0°F.; night, 50°F. to —20°F. May to September, day 120°F. to 50°F.; night, 75°F. to 40°F. . . . (To meet these conditions) I would suggest that the insects be stored in two chambers:

(1) A large bucket (of wood) or a can, for general storage. (This should have on the bottom) a layer of clay, then a layer of stones of about one inch diameter, 3 or 4 deep, and on top of this, a deep layer of moist, loose humus. This large container can be stored in a cool dark basement and provided with a per-

forated tin lid for holding ice in summer, and will provide shelter from excessive heat or cold. If ice is used, a drainage hole should be provided in one side just below the rocks, above the layer of clay. (Paraphrased. G.J.S.).

(2) An observation chamber. A glass-sided box, 12 inches square and 2 inches wide, with wooden or metal ends and bottom, open at the top. This should contain two layers of stones of one inch diameter, continued up one side; on top of the stones, a layer of clay an inch thick to hold the stones in place, especially those up the side. Then another layer of inch-diameter stones with several layers of small pebbles on top (and finally, the narrow chamber should be) filled up with loose, damp humus.

"The stones up one side of the chamber are for summer use; on them should be placed a small perforated can containing ice whose dripping can leak down the stones and along the bottom to keep the whole chamber cool and moist without making the humus marshy. A draining hole on one end, at the rock level and below the clay, will let out excess water. This observation chamber should be kept on a solid bench or on a table where slamming doors or other vibrations will not disturb the insects, and should be sprayed at intervals with a fine mist of water to simulate rain. Since this chamber is so narrow, the insects can be observed through the glass sides as they move up and down. As they are very sensitive to light, a red light should be used for observations. (Paraphrased by G.J.S.)

CONCERNING FOSSILS.—

"That fossil forms of *Grylloblatta* have not been found to date, is not very surprising since *Grylloblatta* himself has been known to science only since 1913. Most of our fossils are 'split out' from layers of sedimentary rock. But *Grylloblatta* will not be found in such layers; he will be found in a hard conglomerate since he was swept down the hillsides by slides and avalanches and buried. I have been working a little on that angle during the summer but with so little time to do it in, of course I have little success to report. I found no *Grylloblatta* (in the rocks), only leaves and twigs."

POSTSCRIPT BY G. J. SPENCER.—

In his last letter to me written on October 4, 1940, Mr. Campbell said . . . "Since I came down here (to New Westminster) I have had a notion to explore the foothills near the Lions and Grouse Mountain or the hills north of a line (drawn from) Sardis to Chilliwack where I believe *Grylloblatta* may be found, or even around Yale and Hope. If you have any students keen enough and possessing a car, I wouldn't mind making a two- or three-day trip, sharing the expenses, when I get my holidays. If you have any enthusiasts along this line I would be glad to hear from them and make arrangements." He was killed three days later.

We have here a remarkable series of observations by a man, who, while deploring his lack of education, had sufficient enthusiasm and enterprise to spend many hours of his limited free time, combing the Kamloops hills for an insect which fascinated him. Never once in his original notes does he call *Grylloblatta* an "insect" or speak of it as "it"; it was always "he," "him," or "*Grylloblatta*," a real personality, and he maintained cultures in his basement in the face of some slight hostility from his family.

Mr. Campbell's notes bring up many points for discussion, but I would emphasize only two at this time; *one*, that the Kamloops *Grylloblatta* is apparently a separate race from the Banff-Jasper high-altitude, snow or ice-edge form, and one which can tolerate temperatures far above those of the mountain form, and, if Mr. Campbell's records are correct, it is a form that freezes to death with only 6 degrees of frost, and *two*, that precise and detailed studies of the Kamloops *Grylloblatta* are long overdue.

AN EXPERIMENT WITH LARVAE OF LAMBDINA FISCELLARIA SOMNIARIA HULST

J. R. J. LLEWELLYN JONES
Cobble Hill, B.C.

As long ago as 1905 it was recognized that there was a close connection between the oak looper, then known as *Therina somniaria* Hulst, and the hemlock looper, *Therina fiscellaria* Guenee.

In the Bulletin of the British Columbia Entomological Society, 1906, No. 3, September, page 3, in an article entitled "*Therina somniaria* at Victoria," Dr. J. Fletcher is quoted as saying that, during an outbreak the previous year, larvae of *somniaria* were observed feeding on western hemlock, spruce and Douglas fir. Also the Rev. G. W. Taylor is reported as considering *somniaria* Hulst, to be a variety of *fiscellaria* Guenee.

More recently a paper has been published by H. W. Capps entitled "Some American Geometrid moths of the subfamily Ennominae heretofore associated with or closely related to *Ellopia* Treitschke" (Proc. United States Museum, 93 (3159):115-150, Washington, 1943) in which the writer regards *somniaria* Hlst., as a regional race of *fiscellaria* Guenee and places them in a new genus *Lambdina* Capps. He states that examination of the genitalia confirms his arrangement. The oak looper therefore becomes *Lambdina fiscellaria somniaria* Hlst., and the western hemlock looper *Lambdina fiscellaria lugubrosa* Hlst.

In support of this view, I submit the following notes on an experiment carried out last season with larvae of *somniaria*, obtained during a severe but local outbreak in the Saanich District of Victoria on Garry oak, *Quercus garryana* Douglas.

Eleven hundred larvae were obtained in varying stages of growth. Of these two hundred were placed in a container and fed with western hemlock, *Tsuga heterophylla Sargent*. The larvae readily accepted this and fed to maturity. Sixty-three imagines were obtained during September and October, a percentage of 31.5. Of the remaining 900, which were allowed to continue feeding on Garry oak, 473 imagines were obtained, a percentage of 52.5.

Both groups of insects showed the same range of colour variation, but there was an appreciable difference in the size of the imagines. Those which had been given hemlock were smaller and more close the normal size of *fiscellaria lugubrosa* Hlst.

Average measurements were as follows:

1. Fed on oak 1.75 inches.
2. Fed on hemlock 1.50 inches.

The converse experiment was not so successful due chiefly to the lack of healthy specimens. Some 70 larvae of the hemlock looper, *L. fiscellaria lugubrosa* Hlst., were received from Mr. G. R. Wyatt, early in August from the Sarita River area on Vancouver Island. They were heavily parasitized and also were suffering from a virus infection, consequently mortality was great. Only one imago was obtained, a rather small sized male. The larvae survived long enongh however to satisfy me that they would readily accept oak as a food plant. About 20 larvae were supplied with oak, which they promptly ate.

In conclusion, it would seem reasonable and, I deem, desirable, to accept H. W. Capps' re-arrangement of this group, about which, in the past, there has been some disagreement and speculation.

A REVISED CHECK LIST OF THE FLEAS OF BRITISH COLUMBIA*

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Harvey (1907) gave the first published account of the fleas of this province, listing six species, three of which had recently (1896-1904) been described from the Queen Charlotte Islands, B.C., by Dr. Carl F. Baker. Over the period 1902-1933 many other species from British Columbia were described by the Hon. N. Charles Rothschild and/or Dr. Dr. Karl Jordan of the Zoological Museum, Tring, Herts., England. The type series of most of these were collected in the Fraser Delta, the Okanagan Valley, the Upper Columbia River and the Rocky Mountains. Spencer (1936) presented to this Society a briefly annotated list of 61 species offleas known to occur in British Columbia, based partly on his own extensive collections of these insects (identified by Dr. Julius Wagner of Belgrade, Yugoslavia) and partly on information received through correspondence with Dr. Jordan. Subsequent papers by Spencer, Wagner and the present writer in various journals have improved our knowledge of British Columbia fleas by adding records and descriptions of new species on one hand, and by subtracting proved synonyms on the other. In a paper entitled "The Siphonaptera of Canada" (not in print at the time of writing) the writer discusses 127 species and subspecies of fleas, of which 89 were collected within the political boundaries of British Columbia. While this paper gives all available data on the siphonapterous fauna of British Columbia as well as other provinces, up to December 31, 1946, the following account is presented here for convenience of reference, and following the useful policy of this journal of publishing lists of various groups of insects occurring within the provincial boundaries. In addition, some supplementary data and four new records are included, bringing the British Columbia list up to 93 species and subspecies, of which 88 are indigenous, and five evidently introduced within historic times.

The fleas constitute a small order, Costa Lima and Hathaway (1946) recording only 1193 known species and subspecies for the World—and their list contains many synonyms! It will be seen then, that British Columbia is well endowed, supporting about one-thirteenth of the total known flea fauna. Of course, future collecting in the more remote and inaccessible parts of the World may well alter this proportion.

There are now 134 species and subspecies of fleas known from the whole of Canada. Seventy percent of these are recorded from British Columbia. This relatively extensive proportion is in part a reflection of the tremendous variety of mammal, and especially small mammal, life of the west. This again is a product of the numerous climatic and altitudinal regions of this rugged province, which, coupled with other factors, have had such a profound influence in developing the diversity of plant cover on which all animals depend, directly or indirectly. Munro and Cowan (1947) define and trace 13 terrestrial and 2 marine biotic areas, distinguished by readily demonstrable peculiarities of weather, vegetation, animal life, etc., from contiguous areas. Thus the tremendous size, range of latitude, mountainous topography and variable climatic regions of the province, as well as its recent geological history, including land connections with Asia, have brought us an enviable botanical and zoological heritage, and this exceptional richness of indigenous flora and fauna is traceable even in the lowly fleas.

The following account of the fleas of British Columbia gives all known synonyms, aside from changes in generic assignment, of the various indigenous spe-

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cies. These details are not included with the introduced species. The preferred host or hosts, where known, are indicated, and brief statements relating to the known range in British Columbia. References to biotic areas follow Munro and Cowan. Data on the "type host" (frequently not significant in any case), "type locality" and literature citations relating to original descriptions of the species are not provided, this information being readily available in one or more of the publications listed in the short bibliography at the end of this article. Host records refer to British Columbia only. Subspecific names of hosts are not included in this list.

Order SIPHONAPTERA

Family PULICIDAE

1. **Hoplopsyllus glacialis lynx** (Baker)
   True host: Varying hare, *Lepus americanus* group.
   Recorded hosts: *Lepus americanus, Lynx canadensis, Lynx fasciatus.*
   Range: General, through most of province.
2. **Ctenocephalides canis** (Curtis) (Introduced)
   True host: domestic dog (?).
   Recorded hosts: domestic dogs and cats, tame rabbits, monkeys, man, *Procyon lotor*, rats, *Rattus norvegicus, R. rattus.*
   Range: Limited records at hand from south of province, but probably widespread on dogs and cats.
3. **Ctenocephalides felis felis** (Bouché) (Introduced)
   True host: domestic cats.
   Recorded hosts: same as for *C. canis.* Also *Spilogale gracilis.*
   Range: Probably same as for *canis.*
4. **Pulex irritans irritans** Linnaeus
   True host: unknown; Artiodactyla (?).
   Recorded hosts: man, *Rattus norvegicus, Odocoileus hemionus, Speotyto cunicularia.*
   Range: Fairly general.
5. **Xenopsylla cheopis** (Rothschild) (Introduced)
   True host: domestic rats, *Rattus* spp.
   Recorded hosts: *Rattus norvegicus, Rattus r. rattus, Rattus r. alexandrinus.*
   Range: Confined at present to extreme southwestern mainland of province (Puget Sound lowlands).

Family VERMIPSYLLIDAE

6. **Arctopsylla ursi** (Rothschild)
   True host: grizzly bears, *Ursus* spp.
   Recorded hosts: *Ursus* spp.
   Range: Probably general, especially in Alplands, and northern B. C.
7. **Chaetopsylla setosa** (Rothschild)
   True hosts: various large carnivores.
   Recorded hosts: *Canis latrans, Euarctos americanus, Ursus* spp., *Lynx canadensis, Gulo luscus.*
   Range: Probably general.

Family HYSTRICHOPSYLLIDAE

8. **Atyphloceras artius** Jordan
   True host: Cricetidae.
   Recorded host: *Peromyscus maniculatus.*
   Range: Known only from Kelowna.
9. **Atyphloceras multidentatus** (C. Fox)
   True host: various Cricetidae.
   Recorded hosts: *Spilogale gracilis, Peromyscus maniculatus, Microtus oregoni, Microtus townsendii, Rattus norvegicus.*
   Range: Puget Sound Lowlands, Vancouver Island.
10. **Hystrichopsylla dippiei** Rothschild
    True host: small Rodentia.
    Recorded hosts: *Sorex* sp., *Mustela vison, Spilogale gracilis, Citellus columbianus, Tamiasciurus hudsonicus, Eutamias* sp., *Peromyscus maniculatus, Clethrionomys gapperi, Microtus longicaudus, M. montanus.*
    Range: Fairly general. Not common.
11. **Hystrichopsylla** n. sp.
    A new species, to be described from western B. C. in "Siphonaptera of Canada."
12. **Hystrichopsylla** n. sp.
    A new species, to be described from Vancouver, B. C., in "Siphonaptera of Canada."
13. **Hystrichopsylla schefferi** Chapin (=*H. mammoth* Chapin)
    True host: mountain beaver, *Aplodontia rufa.*
    Recorded hosts: *Mustela vison, Spilogale gracilis.*
    Range: Southwest mainland.
14. **Catallagia charlottensis** (Baker) (=*C. motei* Hubbard)
    True host: white-footed mouse, *Peromyscus maniculatus.*
    Recorded hosts: *Scapanus orarius, Neurotrichus gibbsii, Peromyscus maniculatus, Clethrionomys gapperi, Microtus townsendii, M. oregoni, M. pennsylvanicus, M. longicaudus, Rattus norvegicus, Tamiasciurus hudsonicus.*
    Range: Coastal islands, and Pacific slopes, west of the Coast Range.
15. **Catallagia decipiens** Rothschild (=*C. moneris* Jordan)
    True host: White-footed mouse, *Peromyscus maniculatus.*
    Recorded hosts: *Mustela frenata, Citellus columbianus, Tamiasciurus hudsonicus, Peromyscus maniculatus, Neotoma cinerea, Microtus longicaudus, M. pennsylvanicus, M. montanus, Phenacomys intermedius, Clethrionomys gapperi, Eutamias* sp., *Thomomys talpoides, Ochotona princeps.*

16. **Catallagia scullenі** Hubbard
(=*C. chamberlini* Hubbard, *C. vonbloekeri* Augustson, *C. rutherfordi* Augustson).
True host: Cricetidae, especially *Peromyscus maniculatus.*
Recorded hosts: *Scapanus orarius, Eutamias* sp., *Microtus richardsoni, Clethrionomys gapperi, Peromyscus maniculatus.*
Range: Southern Coast Range; parts of Fraser Valley; Vancouver Island.

17. **Delotelis telegoni** (Rothschild)
True host: Cricetidae.
Recorded hosts: *Microtus pennsylvanicus, M. longicaudus, M. townsendii, M. oregoni, Clethrionomys gapperi, Peromyscus maniculatus.*
Range: Southern part of province, from Rockies to coast. Rare.

18. **Epitedia scapani** (Wagner)
(=*E. jordani* Hubbard, *E. stewarti* Hubbard).
True host: White-footed mouse, *Peromyscus maniculatus;* also common on Insectivora.
Recorded hosts: *Scapanus orarius, S. townsendii, Neurotrichus gibbsii, Sorex* spp., *Mustela* sp., *Microtus orcgoni, Peromyscus maniculatus, Rattus norvegicus, Aplodontia rufa.*
Range: Puget Sound Lowlands.

19. **Epitedia wenmanni** (Rothschild)
(=*Neopsylla similis* Chapin).
True host: White-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Microtus pennsylvanicus, Peromyscus maniculatus, Neotoma cinerea, Tamiasciurus hudsonicus.*
Range: Coast Range to Rockies, but not Pacific slopes.

20. **Neopsylla inopina** Rothschild
True host: ground squirrel, *Citellus* spp.
Recorded host: *Citellus columbianus.*
Range: Southern Kootenays, through Crow's Nest Pass.

21. **Phalacropsylla allos** Wagner
True host: woodrat, *Neotoma cinerea.*
Recorded host: *Neotoma cinerea occidentalis.*
Range: Probably restricted to Osoyoos-Arid biotic area.
New record: 12 miles west of Hedley, B.C., on banks of Similkameen River, 23.IV.48, coll. G. P. Holland.

22. **Meringis shannoni** (Jordan)
True host: pocket mouse, *Perognathus* spp.
Recorded hosts: *Perognathus parvus, Peromyscus maniculatus.*
Range: Okanagan Valley, from Vernon, south to border.

23. **Micropsylla sectilis sectilis** (Jordan and Rothschild)
(=*Micropsylla peromyscus* Dunn)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Citellus columbianus, Tamiasciurus hudsonicus, Peromyscus maniculatus, Mus musculus.*
Range: Southern B.C., east of the Coast Range.

24. **Micropsylla sectilis goodi** Hubbard
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Mustela erminea, Spilogale gracilis, Tamiasciurus douglassi, Microtus oregoni, Peromyscus maniculatus, Rattus norvegicus.*
Range: Southern B.C., west of the Coast Range.

25. **Rectofrontia fraterna** (Baker)
(=*Neopsylla hamiltoni* Dunn)
True host: small Rodentia.
Recorded hosts: *Martes americana, Tamiasciurus hudsonicus, Phenacomys intermedius, Neotoma cinerea, Ochotona princeps.*
Range: Scattered over southern B.C. Rare.

26. **Trichopsylloides oregonensis** Ewing
(=*Phaneris hubbardi* Jordan)
True host: mountain beaver, *Aplodontia rufa.*
Recorded host: *Mustela vison.*
Range: Puget Sound Lowlands.

27. **Corrodopsylla curvata curvata** (Rothschild)
True host: shrew, *Sorex,* spp.
Recorded hosts: *Sorex obscurus, Sorex* spp.
Range: East of Cascade Mountains.

28. **Corrodopsylla curvata obtusata** (Wagner)
(=*Doratopsylla jellisoni* Hubbard)
True host: shrew, *Sorex* spp.
Recorded hosts: *Sorex spp., S. trowbridgii, S. vagrans, Neurotrichus gibbsii, Microtus oregoni.*
Range: West of Cascades, including Vancouver Island.

29. **Callistopsyllus terinus** (Rothschild)
(=*Callistopsyllus paraterinus* Wagner)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Citellus columbianus, Peromyscus maniculatus.*
Range: Columbia Forest.

30. **Megarthroglossus divisus divisus** (Baker)
(=*Pulex longispinus* Baker)
True host: squirrel, *Tamiasciurus;* woodrat, *Neotoma.*
Recorded hosts: *Microtus longicaudus, Neotoma cinerea.*
Range: Southern B.C., east of Selkirks.

31. **Megarthroglossus divisus exsecatus** Wagner
True host: red squirrel, *Tamiasciurus hudsonicus.*
Recorded hosts: *Tamiasciurus hudsonicus, Glaucomys sabrinus, Peromyscus maniculatus.*
Range: Southern B.C., Cascades to Selkirks.

32. Megarthroglossus procus Jordan and child
True host: Chickaree, *Tamiasciurus douglassi*.
Recorded hosts: *Spilogale gracilis, Tamiasciurus douglassi, Glaucomys sabrinus, Rattus norvegicus*.
Range: Coast Forest (southern mainland only).

33. Megarthroglossus pygmaeus Wagner
True host: probably woodrat, *Neotoma cinerea*.
Recorded host: *Neotoma cinerea*.
Range: Known only from Nicola.

34. Megarthroglossus sicamus Jordan and Rothschild
True host: unknown, probably woodrat, *Neotoma*.
Recorded hosts: *Canis latrans, Lynx fasciatus, Neotoma cinerea*.
Range: Probably restricted to Dry Forest biotic area.

35. Megarthroglossus similis Wagner
True host: probably woodrat, *Neotoma*.
Recorded host: *Neotoma cinerea*.
Range: Known only from Beaverdell.

36. Megarthroglossus spenceri Wagner
True host: unknown.
Recorded host: *Ochotona princeps*.
Range: Known only from Nicola.

37. Corypsylla ornata Fox
True host: mole, *Scapanus* spp.
Recorded hosts: *Scapanus orarius, S. townsendii, Microtus oregoni, M. townsendii*.
Range: Puget Sound Lowlands, north and south of Fraser River.

38. Corypsylla jordani Hubbard
True host: shrew-mole, *Neurotrichus gibbsii*.
Recorded host: *Neurotrichus gibbsii*.
Range: Puget Sound Lowlands. *New record:* Silver Creek, 15.III.48, coll. G. P. Holland.

39. Corpsylloides kohlsi (Hubbard)
(=*C. spinata* Fox)
True host: shrew, *Sorex* spp.
Recorded host: *Sorex obscurus*.
Range: Puget Sound Lowlands. *New record:* Silver Creek, 11.X.47, coll. G. P. Holland.

40. Nearctopsylla brooksi (Rothschild)
True host: unknown, probably *Sorex;* possibly *Mustela*.
Recorded hosts: *Mustela erminea, M. frenata, M. vison, Martes americana*.
Range: Widespread over province.

41. Nearctopsylla hyrtaci (Rothschild)
True host: shrew, *Sorex* spp.
Recorded hosts: *Sorex obscurus, S. cinereus, Mustela vison, M. frenata, Martes caurina, M. americana, Clethrionomys gapperi*.
Range: Southern half of province, including Vancouver Island.

42. Nearctopsylla jordani Hubbard
(=*N. hygini columbiana* Wagner)
True host: mole, *Scapanus* spp.
Recorded hosts: *Scapanus orarius, Neurotrichus gibbsii*.
Range: Puget Sound Lowlands.

FAMILY CERATOPHYLLIDAE

43. Ctenophyllus terribilis (Rothschild)
True host: pika, *Ochotona* spp.
Recorded host: *Ochotona princeps*.
Range: Southern Alplands, and some contiguous areas. Coincident with host.

44. Dolichopsyllus stylosus (Baker)
True host: mountain beaver, *Aplodontia rufa*.
Recorded host: *Aplodontia rufa*.
Range: Puget Sound Lowlands.

45. Oropsylla arctomys (Baker)
(=*Aetheopsylla septentrionalis* Stewart and Holland).
True host: woodchuck, *Marmota monax*.
Recorded hosts: *Marmota monax, M. caligata*.
Range: Boreal Forest, Columbia Forest.

46. Oropsylla idahoensis (Baker)
(=*Ceratophyllus poeantis* Rothschild, *C. bertholfi* Fox)
True host: ground squirrel, *Citellus* spp.
Recorded hosts: *Mustela frenata, Citellus columbianus, C. lateralis, Ochotona princeps*.
Range: Coincident with ground squirrels in southern half of province.

47. Thrassis acamantis (Rothschild)
True host: yellow-bellied marmot, *Marmota flaviventris*.
Recorded hosts: *Mephitis* sp., *Marmota flaviventris, Citellus columbianus, Eutamias* sp., *Tamiasciurus hudsonicus*.
Range: Dry Forest, Cariboo Parklands.

48. Thrassis petiolatus (Baker)
True host: Columbia ground squirrel, *Citellus columbianus*.
Recorded hosts: *Citellus columbianus, Eutamias* sp., *Thomomys talpoides*.
Range: Coincident with range of *C. columbianus* from Shuswap Lake south, especially in areas at low elevation.

49. Thrassis spenceri Wagner
True host: Alpine marmot, *Marmota caligata* group.
Recorded hosts: *Gulo luscus, Ursus* sp., *Marmota monax, M. caligata, M. vancouverensis*.
Range: Alplands and some contiguous areas.

50. Amphalius necopinus (Jordan)
True host: pika, *Ochotona* spp.
Recorded host: *Ochotona princeps*.
Range: Southern Alplands.

51. Dactylopsylla comis Jordan
True host: Pocket gopher, *Thomomys* spp.
Recorded host: *Thomomys talpoides*.
Range: Known only from Okanagan Landing.

52. **Foxella ignota recula** (Jordan and Rothschild)
True host: pocket gopher, *Thomomys* spp.
Recorded hosts: *Mustela frenata, Citellus columbianus, Thomomys talpoides.*
Range: Dry Forest.

53. **Opisocrostis tuberculatus tuberculatus** (Baker)
True host: ground squirrel, *Citellus* spp.
Recorded host: *Citellus columbianus.*
Range: Southern Kootenays, through Crow's Nest.

54. **Opisodasys keeni** (Baker)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Mustela* sp., *Microtus* sp., *M. townsendii, Clethrionomys gapperi, Peromyscus maniculatus, Zapus* sp.
Range: Apparently general, through province.

55. **Opisodasys pseudarctomys** (Baker)
(=*Ceratophyllus acasti* Rothschild)
True host: flying squirrel, *Glaucomys* spp.
Recorded hosts: *Tamiasciurus hudsonicus, Glaucomys sabrinus.*
Range: Scattered; southern B.C. east of Coast Range.

56. **Opisodasys vesperalis** (Jordan)
True host: flying squirrel, *Glaucomys* spp.
Recorded hosts: *Mustela* sp., *Lynx* sp., *Glaucomys sabrinus.*
Range: Dry Forest and southern Coast Forest.

57. **Orchopeas caedens caedens** (Jordan)
True host: red squirrel, *Tamiasciurus hudsonicus.*
Recorded host: *Tamiasciurus hudsonicus.*
Range: (Roughly) north of 53°.

58. **Orchopeas caedens durus** (Jordan)
True host: red squirrel, *Tamiasciurus hudsonicus.*
Recorded hosts: *Mustela frenata, M. erminea, Lynx canadensis, Tamiasciurus hudsonicus, Glaucomys sabrinus, Eutamias* sp.
Range: (Roughly) south of 53°.

59. **Orchopeas leucopus** (Baker)
(=*Ceratophyllus aeger* Rothschild)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded host: *Peromyscus maniculatus.*
Range: Probably northern half of province.

60. **Orchopeas nepos** (Rothschild)
True host: Chickaree, *Tamiasciurus douglassi.*
Recorded hosts: *Mustela vison, M. erminea, Spilogale gracilis, Tamiasciurus douglassi, Glaucomys sabrinus.*
Range: Coast Forest (southern mainland only).

61. **Orchopeas sexdentatus agilis** (Rothschild)
True host: woodrat, *Neotoma cinerea.*
Recorded hosts: *Mustela frenata, Spilogale gracilis, Clethrionomys gapperi, Neotoma cinerea, Ochotona princeps, Sylvilagus nuttalli.*
Range: Through most of province.

62. **Tarsopsylla coloradensis** (Baker)
(=*Opisodasys jellisoni* Fox)
True host: squirrel, *Tamiasciurus* and *Glaucomys.*
Recorded hosts: *Martes americana, Tamiasciurus hudsonicus, Glaucomys* sabrinus.
Range: In mountains, and probably throughout much of northern part of province.

63. **Ceratophyllus adustus** Jordan
True host: unknown. A bird?
Recorded host: *Erethizon dorsatum.*
Range: Known only from Atlin.

64. **Ceratophyllus celsus celsus** Jordan
True host: bank swallow, *Riparia riparia.*
Recorded host: *Riparia riparia.*
Range: Known only from Kamloops and Okanagan Falls.

65. **Ceratophyllus diffinis** Jordan
(=*C. rileyi* Liu)
True host: many birds.
Recorded hosts: *Bonassa umbellus, Melospiza melodia.*
Range: Probably southern half of province.

66. **Ceratophyllus garei** Rothschild
(=*C. utahensis* Chapin, *C. quebecensis* Fox)
True host: ground-nesting birds.
Recorded host: *Erismatura jamaicensis.*
Range: Probably widespread. One record available, from Kamloops.

67. **Ceratophyllus idius** Jordan and Rothschild
True host: tree swallow, *Iridoprocne bicolor.*
Recorded hosts: *Asio otus, Iridoprocne bicolor.*
Range: Known only from Okanagan at present.

68. **Ceratophyllus niger** Fox
(=*C. niger inflexus* Jordan)
True host: various birds.
Recorded hosts: *Phalacrocorax pelagicus, Gallus gallus, Otus asio, Cryptoglaux acadica, Acridotheres cristatellus, Vermivora celata, Turdus migratorius, Passer domesticus, Tamiasciurus hudsonicus.*
Range: Common in southern half of province.

69. **Ceratophyllus petrochelidoni** Wagner
True host: cliff swallow, *Petrochelidon pyrrhonata.*
Recorded host: *Petrochelidon pyrrhonata.*
Range: Known only from Chilcotin and Kamloops.

70. **Ceratophyilus riparius** Jordan and Rothschild
True host: bank swallow, *Riparia riparia.*
Recorded host: *Riparia riparia.*
Range: Known only from Kamloops and Okanagan Valley.

71. **Dasypsyllus gallinulae perpinnatus** (Baker)
True host: Passeriformes.
Recorded hosts: *Thryomanes bewicki, Sphyrapicus ruber, Cyanocitta stelleri, Vermivora celata, Lanivireo solitarius, Pheucticus melonacephalus, Hylocichla guttata, H. ustulata, Pipilo maculatus, Parus atricapillis, Piranga ludoviciana, Regulus calendula, Empidonax difficilis, Turdus migratorius, Junco oreganus, Zonotrichia coronata, Melospiza melodia, Tamiasciurus douglassi,* man.
Range: Coast Forest (west of Cascades only).

72. **Dasypsyllus stejnegeri** (Jordan)
True host: unknown. A sea bird?
Recorded host: *Hylocichla guttata nanus.*
Range: Probably northern Coast Littoral. *New record:* Langara Island, Queen Charlottes, 20.V.47, coll. C. J. Guiguet.

73. **Malaraeus euphorbi** (Rothschild)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded host: *Peromyscus maniculatus.*
Range: Widespread, though rare, in southern half of province.

74. **Malaraeus penicilliger** ssp. (**dissimilis** Jordan?)
True host: Microtinae.
Recorded hosts: *Clethrionomys gapperi, Peromyscus maniculatus.*
Range: Northern part of province, and southern Alplands.

75. **Malaraeus telchinum** (Rothschild)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Sorex* sp., *Citellus columbianus, Microtus longicaudus, Clethrionomys gapperi, Peromyscus maniculatus.*
Range: General, throughout southern half of province.

76. **Megabothris abantis** (Rothschild)
(=*Megabothris adversus* Wagner)
True host: Microtinae.
Recorded hosts: *Mustela erminea, M. frenata, Vulpes fulva, Citellus columbianus, Microtus longicaudus, M. pennsylvanicus, M. oregoni, Clethrionomys gapperi, Phenacomys intermedius, Synaptomys borealis, Peromyscus maniculatus, Neotoma cinerea, Rattus norvegicus, Zapus princeps, Z. trinotatus, Lepus americanus, Ochotona princeps.*
Range: General over province, especially in humid areas.

77. **Megabothris asio megacolpus** (Jordan)
True host: meadow mouse, *Microtus pennsylvanicus.*
Recorded host: *Microtus pennsylvanicus.*
Range: Probably occurs throughout most of province.

78. **Megabothris lucifer** (Rothschild)
True host: gray vole, *Microtus montanus.*
Recorded hosts: *Mustela frenata, Microtus montanus.*
Range: Dry Forest.

79. **Megabothris quirini** (Rothschild)
True host: Microtinae.
Recorded hosts: *Tamiasciurus hudsonicus, Microtus p. drummondi, Clethrionomys gapperi, Peromyscus maniculatus.*
Range: General, east of Coast Range.

80. **Monopsyllus ciliatus protinus** (Jordan)
True host: squirrel, *Tamiasciurus.*
Recorded hosts: *Mustela erminea, Martes caurina, Spilogale gracilis, Tamiasciurus douglassi, T. hudsonicus, Glaucomys sabrinus, Eutamias townsendii, Peromyscus maniculatus, Lepus americanus.*
Range: Southern part of Coast Forest, including Vancouver Island.

81. **Monopsyllus eumolpi eumolpi** (Rothschild)
True host: chipmunk, *Eutamias* spp.
Recorded hosts: *Mustela frenata, Citellus columbianus, Tamiasciurus hudsonicus, Eutamias amoenus, E. minimus, Clethrionomys gapperi.*
Range: Throughout province, east of Coast Range.

82. **Monopsyllus vison** (Baker)
(=*Ceratophyllus lucidus* Baker)
True host: red squirrel, *Tamiasciurus hudsonicus.*
Recorded hosts: *Mustela frenata, Martes americana, Citellus columbianus, Tamiasciurus hudsonicus, Glaucomys sabrinus, Ochotona princeps.*
Range: Throughout province, east of Coast Range.

83. **Monopsyllus wagneri wagneri** (Baker)
(=*Ceratophyllus peromysci* Stewart)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Mustela frenata, Microtus longicaudus, Clethrionomys gapperi, Peromyscus maniculatus, Phenacomys intermedius, Reithrodontomys megalotis.*
Range: Southern B.C. from Cascades to Rockies.

84. **Monopsyllus wagneri ophidius** (Jordan)
True host: white-footed mouse, *Peromyscus maniculatus.*
Recorded hosts: *Sorex* sp., *Spilogale gracilis, Peromyscus maniculatus.*
Range: Southern B.C., from Cascades, west, including Vancouver Island.

85. **Nosopsyllus fasciatus** (Bosc d'Antic) (Introduced)
True host: rat, *Rattus* spp.
Recorded hosts: *Sorex sp., Tamiasciurus douglassi, Mus musculus, Rattus rattus, R. norvegicus.*
Range: Apparently pretty well restricted to lower coastal region.

86. **Leptopsylla segnis** (Schonherr) (Introduced)
True host: house mouse, *Mus musculus.*
Recorded host: *Mus musculus.*
Range: One record, from Kelowna.

87. **Peromyscopsylla hesperomys** ssp.
A new subspecies, to be described from southern Coast Forest, in "Siphonaptera of Canada."

88. **Peromyscopsylla ravalliensis** (Dunn)
True host: woodrat, *Neotoma cinerea.*
Recorded hosts: *Neotoma cinerea, Peromyscus maniculatus, Ochotona princeps.*
Range: Rare in southern part of province.

89. **Peromyscopsylla selenis** (Rothschild)
True host: Microtinae.
Recorded hosts: *Sorex* sp., *Mustela frenata, Microtus longicaudus, M. oregoni, Clethrionomys gapperi, Phenacomys intermedius, Peromyscus maniculatus, Eutamias* sp., *Rattus norvegicus.*
Range: General, throughout province, especially in mountains and humid forests.

Family ISCHNOPSYLLIDAE

90. **Eptescopsylla vancouverensis** (Wagner)
True host: silver-haired bat, *Lasionycteris noctivagans.*
Recorded host: *Lasionycteris noctivagans.*
Range: Known only from Vancouver.

91. **Myodopsylla gentilis** Jordan and Rothschild
True host: little brown bat, *Myotis lucifugus.*
Recorded hosts: *Myotis lucifugus, M. yumanensis.*
Range: West of Selkirks.

92. **Myodopsylla insignis** (Rothschild)
(=*Ceratopsyllus crosbyi* Baker, *Myodopsylla subulata* Chapin)
True host: little brown bat, *Myotis lucifugus.*
Recorded host: *Myotis* sp.
Range: Known only from Cariboo Parklands in B.C.

93. **Myodopsylloides palposus** (Rothschild)
(=*M. piercei* Augustson)
True host: big brown bat, *Eptesicus fuscus.*
Recorded host: *Eptesicus fuscus.*
Range: Scattered records from southwest B.C.

Erroneous Records

1. **Ceratophyllus gallinae** (Schrank)
Recorded by Harvey, 1907, ex poultry. The specimens Harvey had were presumably *Ceratophyllus niger* Fox 1909, now known as the "western hen flea." *C. gallinae* is restricted to eastern North America, having been introduced from Europe.

2. **Diamanus montanus** (Baker)
Recorded by Holland 1941 from Eagle River, B.C., ex *Gulo luscus.*
Erroneous determination — the specimens were *Thrassis spenceri* Wagner.

ALPHABETICAL INDEX OF HOSTS

Acridotheres cristatellus—Crested mynah
Aplodontia rufa—Mountain beaver
Asio otus—Long-eared owl
Bonassa umbellus—Ruffed grouse
Canis latrans—Coyote
Citellus columbianus—Columbian ground squirrel
Citellus lateralis—Mantled ground squirrel
Clethrionomys gapperi—Red-backed mouse
Cryptoglaux acadica—Saw-whet owl
Empidonax difficilis—Western fly catcher
Eptesicus fuscus—Big brown bat
Erethizon dorsatum—Porcupine
Erismatura jamaicensis—Ruddy duck
Euarctos americanus—Black bear
Eutamias amoenus—Allen chipmunk
Eutamias minimus—Least chipmunk
Eutamias townsendii—Townsend chipmunk
Gallus gallus—Domestic hen
Glaucomys sabrinus—Flying squirrel
Gulo luscus—Wolverine
Hylocichla guttata—Hermit thrush
Hylocichla ustulata—Swainson thrush
Iridoprocne bicolor—Tree swallow
Junco oreganus—Oregon junco
Lasionycteris noctivagans—Silver-haired bat
Lepus americanus—Varying hare
Lynx canadensis—Canada lynx
Lynx fasciatus—Bobcat
Marmota caligata—Hoary marmot
Marmota flaviventris—Yellow-bellied marmot
Marmota monax—Woodchuck
Marmota vancouverensis—Vancouver Island marmot
Martes americana—Pine marten
Martes caurina—Vancouver Island marten
Mephitis sp.—Striped skunk
Melospiza melodia—Song sparrow
Microtus longicaudus—Long-tailed vole
Microtus montanus—Grey vole
Microtus oregoni—Creeping vole
Microtus pennsylvanicus—Meadow vole
Microtus richardsoni—Alpine water vole
Microtus townsendii—Townsend vole
Mus musculus—House mouse
Mustela erminea—Short-tailed weasel
Mustela frenata—Long-tailed weasel
Mustela vison—Mink
Myotis lucifugus—Small brown rat
Myotis yumanensis—Yuma bat
Neotoma cinerea—Woodrat
Neurotrichus gibbsii—Gibb's shrew mole
Ochotona princeps—Rocky Mountain pika
Odocoileus hemionus—Black-tailed deer
Otus asio—Screech owl

Parus atricapillis—Black-capped chickadee
Passer domesticus—English sparrow
Perognathus parvus—Pocket mouse
Peromyscus maniculatus—White-footed mouse
Petrochelidon pyrrhonata—Cliff swallow
Phalacrocorax pelagicus—Pelagic cormorant
Phenacomys intermedius—Lemming mouse
Pheucticus melanocephalus—Black-headed grosbeak
Pipilo maculatus—Spotted towhee
Piranga ludoviciana—Western tanager
Procyon lotor—Raccoon
Rattus norvegicus—Norway rat
Rattus rattus alexandrinus—Roof rat
Rattus rattus rattus—Black rat
Regulus calendula—Ruby-crowned kinglet
Reithrodontomys megalotis—Harvest mouse
Riparia riparia—Bank swallow
Scapanus orarius—Coast mole
Scapanus townsendii—Townsend mole
Sorex cinereus—Cinereus shrew
Sorex obscurus—Dusky shrew
Sorex trowbridgii—Trowbridge shrew
Sorex vagrans—Vagrant shrew
Speotyto cunicularia—Burrowing owl
Sphyrapicus ruber—Red-breasted sapsucker
Spilogale gracilis—Spotted skunk
Sylvilagus nuttalli—Cottontail rabbit
Synaptomys borealis—Bog lemming
Tamiasciurus douglassi—Douglas chickaree
Tamiasciurus hudsonicus—Red squirrel
Thomomys talpoides—Pocket gopher
Thryomanes bewicki—Bewick wren
Turdus migratorius—Robin
Ursus sp.—Grizzly bear
Vermivora celata—Orange-crowned warbler
Vulpes fulva—Red fox
Zapus trinotatus—Northwest coast jumping mouse
Zapus princeps—Rocky Mountain jumping mouse
Zonotrichia coronata—Golden-crowned sparrow

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NOTE ON LONGEVITY OF CERTAIN TICKS (Ixodoidea).—Among the tragedies of the flood of 1948 were the premature deaths of several dozen aged ticks. These represented the survivors of several species and stages undergoing longevity tests at the Dominion Livestock Insect Laboratory, Kamlooups, B.C. Each group had been kept within unopened, cotton plugged, shell vials since they had emerged from eggs or their preceding instars. Except for brief periods, they were always kept in the dark below ground level under one of the laboratory buildings. Since observations have now come to an end, it is fitting to publish the records as they stand. **Ixodes texanus** Banks nymphs and adults, while commencing to die of senility, were 103 and 101 months old respectively. Larvae of this species had previously died at the age of 96 months. This makes a total life cycle of at least 300 months, though this period must be theoretical since these various stages may not have had the vigor to perpetuate themselves beyond a certain age. **Ixodes hearlei** Gregson adults and **Ornithodoros turicata** (Dugas) third nymphs were drowned at the ages of 80 and 100 months.—J. D. Gregson, Kamloops, B.C.

UNUSUAL RECORD OF IXODES SORICIS (Ixodoidea: Ixodidae)—An intresting new host (?) record for **Ixodes soricis** Gregson has occurred in the collection from Silver Creek, Hope, British Columbia, March 29, 1948, of a male of this tick attached to a female of its own species! The hypostome of the male (yet undescribed) was firmly embedded in the integument of an engorged female, ex **Sorex obscurus**, the site of the male's attachment being slightly laterad to the hind coxa.—J. D. Gregson, Kamloops, B.C.

ANTHAXIA PRASINA Horn (Coleoptera:Buprestidae).—**Anthaxia prasina** is recorded from California, but we can add British Columbia to its range. I found them once only, at Copper Mountain in 1930, on flowers of **Rosa nutkana**, when 35 speciments were collected: July 12-13. The stem species, **A. aeneogaster**, was common in the region, usually on various yellow flowers, but was not associated with this colony. **A prasina** is a beautiful blue-green insect; the individuals of my series vary considerably in size, but are constant in colour and other respects.—G. Stace Smith, Creston, B.C.

NOTES ON THE OCCURRENCE OF ORNITHODOROS HERMSI IN BRITISH COLUMBIA, AND ITS PROBABLE RELATION TO RELAPSING FEVER. ARGASIDAE, IXODOIDEA.*

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A new distributional and host record has been established by the recent discovery of the soft tick *Ornithodoros hermsi* Wheeler, Herms and Meyer, at Summerland, British Columbia. Two engorged adult specimens of the tick were forwarded to the Dominion Livestock Insect Laboratory at Kamloops on August 4th, 1948, by Mr. C. V. G. Morgan of the Dominion Fruit Insect Laboratory, Summerland, who, in turn, had received them from a local resident. This person had been bitten some dozen times in bed since April by nocturnal creatures which she believed to be bedbugs. Finally she captured two of the culprits and opened the way for this interesting discovery.

Investigation by the writer revealed her residence to be an old building situated in an orchard on a West Summerland benchland. The occupant and her mother kept no animals and knew of no rodents being present, with the exception of a packrat that had visited her basement the previous fall, and a mouse that she had caught there recently. There was, however, a bluebird nest in an old woodpecker hole in the eaves over an upper verandah. This was examined, and yielded, besides five fledgling bluebirds, a large number of avian bedbugs, *Oeciacus vicarius* Horv., and twenty-six specimens of *Ornithodoros hermsi*. The majority of the ticks had recently fed, and were found in the main nesting material. Since this was without doubt the source of the infestation it is of interest to note that the initial specimens captured had migrated over a distance of two storeys, including accents up wooden and steel bed legs. After the contents of the nest were removed, the enclosure was sprayed with DDT and sealed. However, it is expected that the occasional specimen may still appear in crevices in the well kept but old residence. To date, several feedings on laboratory mice have failed to reveal spirochetes. The human bites produced no effects other than a severe and prolonged local reaction.

This tick record bears two points of considerable interest. Firstly, the biotope records of *O. hermsi*, as stated by Cooley and Kohls, (1935), consist of chipmunk nests in either fir snags, stumps or hollow logs or cabins, but never ground burrows. These observations, together with the marked localization of observed infestations would suggest a possibility that the tick is primarily spread and maintained by an avian host. Secondly, this species is known to bite man, and because of known cases of relapsing fever originating from infested areas, with subsequent isolation of spirochetes from specimens captured there, it has been proven a vector of this disease in California, Colorado, Nevada, Oregon, northern Idaho and Washington (Davis 1942, 1945). In 1930 and 1932 there occurred a series of six human cases of relapsing fever in the Kootenay District of British Columbia, (Palmer and Crawford 1933). Considerable speculation arose as to what the vector could be. Hearle (1934) advanced the theory that one of the Argasid ticks must be involved, though a careful search by staff members of this laboratory failed to find any indications of these parasites. Again, in 1937 this laboratory was informed by Dr. Campbell Brown of Vernon, British Columbia, that two loggers from Okanagan Centre had been suffering from a series of relapses. A further search for vectors once more proved futile. Thus it is seen that an Argasid tick has long been suspected as oc-

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curring in British Columbia, and as pointed out by Davis (1945), the presence of *O. hermsi* in the contiguous areas of northern Idaho and eastern Washington suggested that this species may have been responsible for the above cases. While attempts to find it had failed, the search had been directed only towards rodent hosts and ground burrows. The final discovery of *O. hermsi* in a bird's nest in the province consequently throws an interesting light on the whole picture.

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PARASITIC COLEOPTERA

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Parasitism in the Coleoptera is so rare that when a parasitic species is discovered it is an event of considerable note. There are five known species of beetles parasitic, or suspected of being parasitic on birds and mammals. The collection of the University of British Columbia contains four of these species which is rather remarkable and a tribute to Professor G. J. Spencer who has persistently and assiduously built up this collection.

The species of parasitic Coleoptera represent three families and four genera in the super-family *Staphylinoidea.* The family *Platypsillidae* contains one species only, *Platypsyllus castoris* Ritsema. This curious insect has been known since 1869 and has been taken a considerable number of times both in Europe and America, on beaver, where it is a permanent, obligate parasite.

The head of the adult is provided with a comb-like row of spines near the hind margin. There are no eyes, and the mandibles are vestigial. The maxillae are well developed and are similar to those of other Coleoptera. This insect was placed in a separate order by Westwood, but the larval characters are unmistakably coleopterous. Its place within the order is somewhat in doubt. A careful, morphological study of all stages might yield a permanent solution to the problem.

In the family *Leptinidae* there are two genera and three species. *Leptinus testaceus* Mull., often has been recorded from the nest of bumble bees and once has been recorded as occurring on mice and once from shrews. More recently J. D. Gregson took it on a species of *Sorex* from Silver Creek, B.C., April 26, 1940. This species if correctly determined, is about 2.5 mm. long, reddish brown in colour, with 11 segmented antennae and 5 segmented tarsi. There are 6 visible abdominal segments. The entire body is covered with short setae, sparsely and uniformly distributed. The mouth parts were difficult to distinguish but obviously the maxillae are well developed while the mandibles appear to be vestigial and the eyes are wanting. The front coxae are contiguous, the intercoxal piece acuminate. The elytra completely or nearly cover the abdomen, and there are no hind wings.

The genus *Leptinillus* is represented by two species, *L. validus* Horn and *L. aplodontiae* Ferris. The former species was described in 1872 and has been recorded from Alaskan beaver skins by C. V. Riley

(Insect Life 1, 1888). Recently this species has been received from Mr. O. French of Lempriere, B.C. These specimens also were taken from beaver skins.

The mandibles appear to be vestigial but the maxillae are well developed with a fringe of recurved spines around the margin of the galea. The antennae are 11 segmented, the abdomen with 6 visible segments as in *Leptinus* but the intercoxal piece of the prosternum separates the front coxae and the tip is blunt, not acuminate as in *Leptinus*. There is also a long tuft of hairs projecting from the tip. This species is nearly 5 mm. long. It is apparently blind as is *Leptinus*.

L. aplodontiae was described by Ferris in 1918. It was taken from a species of *Aplodontia* or mountain beaver, a genus of rodents peculiar to the Pacific Coast. The type locality is Fallen Leaf Lake, Plumas Co., California, the host animal being taken in August, 1917, by W. R. Fisher. The fifth species here dealt with is in the family Silphidae with only one member of the genus, *Lyrosoma opaca*. Mann. It resides in the nests of certain maritime birds and may not be parasitic in the strict sense although it apparently utilizes the birds for transportation purposes. This species does not have the extreme modifications of the other forms such as excessive flattening, blindness, and vestigial mandibles. The compound eyes are well developed but the facets are rather coarse and there are only about 200 to each eye. It is suggested that this may be a species in process of acquiring a parasitic habit, but as yet not strictly parasitic.

I am indebted to Professor Spencer for making certain records available to me in connection with some of these species of parasitic Coleoptera.

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NOTES ON THE LIFE HISTORY OF XANTHORHOE DEFENSARIA GN. (Lepidoptera: Geometridae)

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Several specimens of the geometrid moth, *Xanthorhoe defensaria* Gn., were taken at light on September 19-21, 1947 in the Municipality of Saanich, Vancouver Island, B.C. From one of the specimens a batch of eggs was obtained and half of the resulting caterpillars were reareed to maturity. Since no account of the life-history of this species was available, it is thought that the following notes may be of interest as a confirmation or supplement to what may already be known about this species.

Ovum. Laid on September 20, 1947, in a glass phial in ones and twos, or in small, irregular groups promiscuously disposed on the sides or in the angles of the container. A total of 25 eggs was deposited. They were subsequently kept at a cool room temperature.

The egg is oval, smooth and whitish in colour with a pearly lustre, becoming darker towards hatching time. It is attached to the substratum by an adhesive substance at the small end. Length 0.75 mm. Width 0.5 mm.. The shell is not consumed by the newly emerged caterpillar.

Larva. Eggs hatched on October 8, after an average incubation period of 18 days. As I was not aware of the food plant,

and little choice being available at this season of the year, recourse was made to chickweed (*Stellaria media*) which was reluctantly accepted by the caterpillars. Twelve out of tweny-five were successfully reared; the remainder died during their first instar from unknown causes.

1st Instar. October 8. Length on emergence from egg, 2 mm. General appearance, translucent with a tinge of green. Head oval, light pinkish cinnamon; oceilli conspicuously black; thoracic and prolegs colourless. Each segment with a few very short, slightly knobbed setae, less noticeable on the anterior and posterior segments. Towards the end of this instar a tinge of cinnamon stains the first six abdominal segments. When disturbed, the caterpillar raises the body vertically, curling the anterior portion in a loop, head uppermost. Stadium, 13 days.

2nd Instar. October 21. Length 6 mm. Apart from an increase in size, the colour is more definite, though not pronouncedly so. A light translucent green, tinged as before with pale cinnamon, prevails, with more distinction in shade between dorsal and ventral surfaces. Stadium, 7 days.

3rd Instar. October 27. Length 12-17 mm. Development is irregular, some moulting a few days ahead of others of the same instar. Color still somewhat indecisive; head mottled brown on greenish background and furnished with short depressed hairs; the thoracic and last abdominal segments green, the remainder pale cinnamon, which now shows a definite pattern of small black spots on the dorsum of the second to fifth abdominal, inclusive. These spots mark the outline of an X and are in the form of four black dots with a central longitudinal black dash between them. The X mark is most distinct on the fifth abdominal segment, becoming progressively less toward the second, where it is represented by only two dots.

A loose epidermal fold is now discernable along each side just below the spiracles. Spiracles, almost invisible whitish dots. Stadium, 7 days.

4th Instar. November 4. Length 20-22 mm. In addition to the same general pattern as noted in the previous instar there is a noticeable increase in opacity. An interrupted wavy lateral line of dark brown is now evident, becoming continuous on the last three abdominals. Numerous, very fine longitudinal whitish lines appear on both dorsal and ventral surfaces. These lines are grouped in threes and fours, each group bounded by a more strongly marked line. Spiracles whitish with a faint dusky outline, set on a lighter ground colour. Some caterpillars are more strongly marked than others, or have a more greenish tone throughout. The green, in all cases, prevails to a greater or lesser extent in the thoracic and anal segments. When disturbed, the caterpillars still adopt the curled attitude, but also have developed a habit of straightening and remaining quiet in the typical twig-resembling characteristic of geometrid larvae. If forcibly knocked off the food plant, they feign death by lying stiffly straight like bits of sticks.

They feed at night, and at all times show a decided avoidance of daylight, keeping well to the base of the food plant during the day. Just before pupation, the greatest length of the caterpillars was 23 mm. Stadium, 7 days.

Pupa. Pupated November 11th-18th. Length 10 mm. Width 3 mm. A very slight silken cocoon is made, either among the leaves of the food plant, which are lightly drawn together to form a small cubicle, or as in one case observed, by burrowing just beneath the surface of the soil and spinning a cocoon of grains of soil held together by silken strands. When the cocoon is completed the caterpillar remains quiescent for a period of four days, as noted specifically in one case and assumed to be so in others. The pupa is green at first, changing to a dark mahogany colour in five hours' time. The pleura of the pupa are much lighter in

colour. Abdominal segments are finely punctate. The cremaster is composed of two long and several very short bristles, each with a strongly recurved hook at the tip. These hooked bristles allow the pupa to hold on to the silken strands of the cocoon. Period of pupal stage averages 25 days.

Adult. Emerged December 6-12. The reared specimens average a wing expanse of 27.88 mm. as compared with 24.55 mm. for those taken under natural conditions. These measurements include both sexes, which were approximately equal in numbers.

Remarks. No doubt the temperature of the room was responsible for the unexpected hatching of the eggs, laid so late in the season. It is presumed that under normal conditions these would not have hatched until the following spring, or if the larvae emerged in the fall they would have hibernated in the early stages. No adults have been observed under natural conditions, at or since the emergence of the reared specimens, which would suggest that overwintering in the egg or young larval stage is the rule.

I am indebted to Mr. J. R. Llewellyn Jones for a list of the food plants known to him. These are *Salix* spp., *Alnus rubra*, *Ribes sanguineum* and *Acer macrophyllum*. He adds that the species probably feeds on a wider range of food plants than indicated above, a surmise substantiated in the present instance. All these plants had shed their leaves before the larvae could have utilized them this season, further evidence against normal hatching of the eggs in the fall.

The fact that the bred specimens were larger than their parents is of some significance, for they closely match the form *gigantaria* Swett. which is the normal spring brood. As this species is said to be many brooded, the three other named forms, all from the same district and named by the same authority, may be seasonal varieties. Further breeding along these lines would be interesting and might test the theory that all the forms could be produced from one set of parents in succession during the course of the year. The several variations of this species were pointed out by Blackmore (1917) and described by Swett (1916). Blackmore suggested that they may be seasonal forms of the same species, a status that can only be proved by life history and genitalia studies. The present life history is submitted as a contribution towards a solution of the first of these objectives.

Summary. A female of *Xanthorhoe defensaria* Gn. captured in the Municipality of Saanich, Vancouver I., B.C., on September 20, 1947, laid 25 eggs. These hatched 18 days later and half of the resultant larvae were brought to maturity on the common chickweed (*Stellaria media*). Food plants hitherto recorded are all shrubs. The first instar lasted 13 days; second, 7 days; third, 7 days; fourth, 7 days; a total of 34 days. Pupation took place on December 6-12, and lasted for 25 days. The complete life history from oviposition to adult is therefore 77 days. The reared adults averaged larger than their parents.

Under natural conditions it is assumed that the egg is the overwintering stage and that those laid in confinement developed prematurely owing to the artificial stimulus of ordinary room temperature.

The theory is advanced that all the named forms of this species are seasoned variations, and could be produced in one season by successive breeding from one set of parents.

LITERATURE CITED

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SCAPHINOTUS (NEOCYCHRUS) ANGULATUS SUBSP. MARITIMUS FROM DEPARTURE BAY, B.C. (Coleoptera, Carabidae).—During October 1946, I found by chance at Departure Bay a specimen of that rather scarce carabid beetle **Cychrus tuberculatus** Harr. While this in itself was a worthwhile find, it led to a still more notable discovery.

Being anxious to secure a series of **C. tuberculatus**, I returned shortly to the spot and conducted an extensive search. Although unable to find any more **Cychrus**, I came across two examples of **Scaphinotus (Neocychrus) angulatus** subsp. **maritimus** Van Dyke.

Several ensuing searches over the same area produced no further results of note. However, just about a year later, the discovery of remnants of **C. tuberculatus** in an empty beer bottle gave me the idea of trying out traps. Small pickle jars, sunk in the ground, and baited with fermented quince jelly and honey, proved extremely effective. I kept the traps going for about a month, visiting them as a rule once in two or three days. In this time they yielded a large number of beetles of the genera **Scaphinotus, Pterostichus,** and **Holiciophorus,** among which were twenty-one examples of **Scaphinotus angulatus,** all of the rare black phase **maritimus.**

Only over a very small area were the traps effective in securing **S. angulatus.** If set more than a few yards from an old maple stump, which apparently harbored a colony of these beetles, only common species were taken.

Dr. Van Dyke writes, [1] "The typical phase of the species is listed from Vancouver Island, Western Washington, east of Puget Sound and Portland, Oregon. Numbers were at one time found by Professor O. B. Johnson near Seattle, though it is quite rare in collections."

"The subspecies is but a color phase of the preceding though all specimens found within its area of distribution are similar. It is entirely black and shining and seems to be confined to the Olympic Peninsula of Washington. My type, I collected near Port Angeles. Others seen, are from Melbourne, Hoquiam and the Olympic National Forest. It is also very rare."

Acknowledgments: I am deeply indebted to Mr. H. B. Leech and Dr. Edwin C. Van Dyke for determination of material and also to Dr. Van Dyke for sending me the literature from which the above extracts were taken.—Richard Guppy, Wellington, B.C.

[1] A review of the subgenera **Stenocanthoris** Gistel and **Neocychrus** Roeschke of the genus **Scaphinotus** Dejean—Entomologica Americana 24(1):1-19, 1944.

POECILONOTA MONTANUS Chamb. (Coleoptera:Buprestidae).—In 1945 I discovered a host tree of **Poecilonota montanus** at Creston, B.C. It was a large living tree of **Populus trichocarpa,** with the trunk bark riddled with fresh and old exit holes, and 19 specimens were collected on the trunk: July 22 to August 14. Hoping the next season to discover the earliest date of appearance, the tree was closely watched, but no specimens were seen. This suggested a two-year cycle, so the same watching was followed in 1947, and 13 specimens were gathered: July 13 to August 17. **P. montanus** is larger than **californica,** and much scarcer, and in color exactly matches the bark of the host tree.—G. Stace Smith, Creston, B.C.

THE EGG-POTENTIAL OF ERGATES SPICULATUS Lec. (Coleoptera: Cerambycidae).—On August 1, 1944, I was given a large, heavily-gravid specimen of **Ergates spiculatus** Lec., the long-horned fir stump borer which a citizen had picked up in Riverside Park, Kamloops. The beetle was sluggish on account of the tremendous distension of its abdomen. After cyaniding it, I dissected out the eggs, of which there were 494 in all. They were remarkably uniform in size, averaging 4 mm. in length and 2 mm. diameter at the middle; a very few were slightly smaller, being 3.6 mm. by 1.9 mm. They were uniformly cream colored, shaped like a rugby football but proportionately broader in the middle, with more pointed ends. The micropilar end was slightly indented like a minute crater. The whole surface of the chorion was coarsely and uniformly beaded like the surface of a beaded projector screen.

Since the beetle had been captured and not reared, it was impossible to tell whether or not it had already laid any eggs; certainly the abdomen was so distended that it could not have laid very many, if any at all. The condition of the acrotrophic ovarioles indicated that in this species, all the eggs mature at about the same time because there were no smaller ones developing in the germaria as occurs in the panoistic ovarioles of our common grasshoppers which lay their eggs at intervals, in pods.—G. J. Spencer, Department of Zoology, University of British Columbia, Vancouver, B.C.

GASTRALLUS MARGINIPENNIS Lec. (Coleoptera: Anobiidae).—A new record for British Columbia is **Gastrallus marginipennis,** though two specimens have been in my collection since 1932, but only recently identified by H. B. Leech. Before spring of that year I discovered a host plant, **Clematis ligusticifolia,** on the banks of the Kootenay River at Creston. The stems were riddled with small holes containing larvae. I tried to rear these but only one adult emerged (March 19); later (July 5), the second specimen was taken on the same bush. They are small, compact, brown beetles, resembling **Throscidae,** and have been recorded from California and Colorado.—G. Stace Smith, Crestin, B.C.

HUMMING BIRDS VISITING APHIDS.—In July, 1947, I was watching a red-throated humming bird visiting the flowers in my garden and noted one individual which left the flowers and hovered up and down the large limbs of a nearby apple tree. As no leaves or blossoms occurred on the limb, I made a closer examination and saw the bird introducing its beak among the colonies of woolly apple aphids which were present around the stubs where side shoots had been cut from the main limbs.

The colonies were small, but the bird visited each in turn, being evidently attracted by the drops of honey-dew which are always plentiful on colonies of the aphid. On the other hand, it may have been feeding on the aphids themselves, but I could not determine this point. The waxy covering of the aphids was much torn and disturbed by the activities of the bird.—E. P. Venables, Vernon, B.C.

AN ANNOTATED LIST OF THE COLEOPTERA TAKEN AT OR NEAR TERRACE, BRITISH COLUMBIA. PART 2[1]

M. E. CLARK
Massett, B.C.

ORTHOPERIDAE

Sacium lugubre LeC.—Vidit H. C. Fall.

STAPHYLINIDAE

Micropeplus costatus LeC.—Vidit H. C. Fall.
Micropeplus sp.—On fungus. Unknown to Fall, and not in his collection.
Emalus nigrella LeC.—Taken under pine bark, from tunnels of bark beetles.
Proteinus basalis LeC.—Near one in the LeConte collection; November 3, 1923.
Proteinus n. sp.—Taken June and July, 1931. Probably now in the Fall collection.
Megarthrus sinuatocollis Boisd.—Taken June and July, 1931; vidit H. C. Fall.
Megarthrus sp.—Unknown species, taken in rotten leaves, March 19, 1937.
Anthobium pothos Mann.—June 12, 1920; vidit H. C. Fall and E. C. Van Dyke.
Anthobium sp.—An unknown species.
Acrulia tumidula Makl.—Vidit H. C. Fall.
Phyllodrepa sp. near *megarthroides* Fauv.; det. H. C. Fall.
Phyllodrepa n. sp.
Omalium rivulare Payk.—June and July, by sifting and in fungus; vidit H. C. Fall.
Omalium humerosum Fauv.?—Vidit H. C. Fall, who said "vicinity of."
Omalium n. sp., near *longulum* Makl.; det. H. C. Fall.
Omalium spp.—Four unknown species.
Phloconomus lapponicus Zett.
Porrhodites fenestralis Zett.—Vidit H. C. Fall.
Lathrimaeum pictum Fauv.
Lathrimaeum humerale Csy.—Taken November 3, 1923.
Lathrimaeum reflexicolle Csy.—From mouse nest, March 19, 1935; vidit H. C. Fall.
Lathrimacum sp.—An unknown species from Thornhill Mountain; vidit H. C. Fall.
Arpedium sp.—Three specimens, November 3, 1923, and in 1927; unknown to H. C. Fall.
Acidota sp.—An unknown species taken in 1931.
Amphichroum maculatum Horn—On spathes of skunk cabbage.
Pelecomalium testaceum Mann.—June, 1928, on skunk cabbage; vidit E. C. Van Dyke.
Tilea rufitarsis Csy.—From Thornhill Mountain; vidit R. E. Blackwelder.
Ancyrophorus biimpressus Makl.—Taken on November 24, 1923.
Trogophloeus sp.—An unknown species.
Aploderus linearis LeC.—Taken March 15, 1937; det. H. C. Fall.
Oxytelus fuscipennis Mann.
Oxytelus nitidulus Grav., or possibly *suspectus* Csy.—Collected March 18, 1937; det. H. C. Fall.
Platystethus americanus Er.
Bledius mysticus Fall.
Bledius sp.—An unknown species.
Stenus vexatus Csy.—From muddy puddle of drainage on flat.
Stenus insularis Csy.—From moss on flats.
Stenus corvus Csy.—Taken at Lakelse Lake.
Stenus convictor Csy.—Taken at Lakelse Lake, and in moss, November 5, 1923.
Stenus sp., near *convictor*.—Taken February, 1940.
Stenus nanulus Csy.—Taken at Lakelse Lake, March, 1927, and in rotten leaves.
Stenus sp.—Undescribed species; Lakelse Lake.
Stenus maritimus Mots.—In moss, March, 1935.
Stenus pterobrachys G. & H.—Scarce, June, 1931, and February, 1940.
Stenus alpicola Fauv.—In moss, March 21, 1937.
Stenus egenus Er.—Taken in 1927.
Stenus n. sp.—Collected February, 1940.
Stenus n. sp., nearest *curtus* Csy.—Taken in 1933.
Stenus punctiger Csy.—Taken while sifting, August, 1927.
Stenus sectator Csy.
Stenus sp., near *sectator*.—Vidit H. C. Fall.
Stenus mammops Csy.—Taken in June, 1931.
Stenus reconditus Csy.
Stenus rugifer Csy.
Stenus austini Csy.—In moss, March 18, 1935.
Stenus juno Fab.—Two females and one male; June, 1938.
Stenus pollens Csy.—Taken in 1939.
Stenus sp.—A new species near *monticola* Csy.
Euaestethus sp.—"Species seems new"; det. M. W. Sanderson. Taken by sifting, June and July, 1931.
Paederus pugetensis Csy.—Rare.
Lathrobium rigidum Csy.?—Or near *rigidum;* taken in 1933 and 1938.
Lathrobium sp.—Species near *simile* LeC. Taken in 1938.
Tetartopeus finitimus LeC.—Collected June 1, 1920; one sent to Casey.
Lathrotropis sp.—An unknown species.
?Medon sp.—"Or near"; March 4.
Orus punctatus Csy.—Vidit H. C. Fall.
Stilicus oregonus Csy.—Rare; taken in 1931.
Astenus longiusculus Man.
Nudobius cephalus Say.—Rare.
Nudobius spp.—Two unknown species.
Gyrohypnus fusciceps LeC.
Gyrohypnus sp. near *fusciceps*.
Gyrohypnus obsidianus Melsh.—Rare, taken in 1931; vidit H. C. Fall.
Gyrohypnus obscurus Er. — Species vera, teste H. C. Fall.

[1] Part I appeared in the previous issue of this journal, pp. 24-27. I am again greatly indebted to Mr. C. A. Frost, who has checked the manuscript, and who in past years submitted many of my beetles to the late Dr. H. C. Fall and others for identification or verification.

Leptacinodes nigritulus LeC.—February 6, 1926.
Hesperolinus piceus Csy.—One pair taken in 1933.
Hesperolinus brunnescens LeC.
Parothius californicus Mann.—Vidit H. C. Fall.
Baptolinus macrocephalus Nordm.
Philonthus—(All species passed on by H. C. Fall).
Philonthus furvus Nordm.
Philonthus sp., near *politus* Linn.
Philonthus sp., near *atratus* Grav.—Under grizzly bear bones.
Philonthus varians Payk.
Philonthus sp.—Unknown to C. A. Frost and H. C. Fall.
Philonthus sordidus Grav.
Philonthus crotchi Horn, or near.
Philonthus nigritulus Grav.—Scarce.
Philonthus nigritulus Grav., or near.—In numbers in old sacks, March, 1937.
Philonthus longicornis Steph.—Rare.
Philonthus aurulentus Horn.
Philonthus tetragonocephalus Notman.—Scarce.
Philonthus agilis Grav.—Taken in 1931.
Philonthus punctatellus Horn. — Taken in 1937.
Philonthus microphthalmus Horn. — Taken in 1937.
Philonthus quadricollis Horn. — Taken in 1937.
Philonthus debilis Grav.—Taken in 1937.
Philonthus sp., near *quadricollis*.—Taken in 1937.
Staphylinus fossator Grav.—About stables.
Staphylinus pleuralis LeC.—On dung, and under boards.
Staphylinus caesareus Cederhj.
Ontholestes cingulatus Grav.—Frequent, on cow and horse dung.
Creophilus villosus Grav.—Scarce; on carrion.
Heterothops californicus LeC. — Taken in 1931; vidit H. C. Fall.
Heterothops carbonatus Fall.—Vidit H. C. Fall.
Quedius sp., near *marginalis* Makl.—Taken in 1931.
Quedius laevigatus Gyll.
Quedius mesomelinus Marsh.
Quedius aenescens Makl., or near — Under grizzly bear bones.
Tachinus maculicollis Makl.—From fungus, November, 1919.
Tachinus basalis Er.
Tachinus crotchi Horn.
Tachinus circumcinctus Makl. — Taken in August, 1927.
Tachinus nigricornis Mann.—Taken by sifting in 1927 and 1931.
Tachinus instabilis Makl.—Taken in 1931.
Tachinus tachyporoides Horn. — Taken in 1931.
Tachyporus acaudus Say.—Under bits of wood, loose bark, etc., frequent in spring; det. Blackwelder.
Tachyporus nitidulus Fab.—Det. Blackwelder.
Tachyporus rulomus Blkwr.—Taken March 9, 1927; det. Blackwelder.
Tachyporus jocosus Say.?
Bolitobius cincticollis Say.
Bolitobius poecilus Mann.
Bolitobius absoletus Say., or near.—H. C. Fall remarked "No concusion."
Bolitobius n. sp., near *intrusus* Horn.
Bolitobius intrusus Horn.
Bryoporus rufescens LeC.
Mycetoporus flavicollis LeC.—Taken by sifting; June and July, 1931
Mycetoporus humidus Say.—In rotting fungus, June and July, 1931.
Mycetoporus splendidus Grav.—According to H. C. Fall.
Deinopsis spp.—Several unidentified species.
Myllaena sp.—Not identified.
Datomicra zosterae Thoms.
Acrotona fungi Grav.—Taken on decayed soft fungus.
Aleochara bimaculata Grav.
Aleochara sp.—Taken in 1938. Species not known to H. C. Fall.

PSELAPHIDAE

Sonoma corticina Csy.—Rare; found under a board in April.
Sonoma parviceps Makl.—Rare; taken by sifting in June and July; vidit A. S. Nicolay.
Cupila clavicornis Makl.—Very rare; det. A. S. Nicolay.
Actium retractum Csy. — Two specimens; vidit A. S. Nicolay.
Actium pacificum Csy., "or near".—Det. H. C. Fall.
Reichenbachia spp.—Two undescribed species; vidit H. C. Fall.
Tychus tenellus LeC.—Rare; shaken from moss, November, 1920.
Tychus cognatus LeC.—Rare; taken by sifting, June and July, 1931.
Pselaphus bellax Csy.—Rare; taken by sifting, June and July, 1931; vidit H. C. Fall.

PTILIIDAE

Ptenidium pullum Makl., "or near; legs lighter" (note by H. C. Fall). From a squirrel's nest, February 4 and March 18, 1935.
Acratrichis spp.—A large and a small species in moss in November, both unidentified.
Ptiliidae—A dozen specimens of an unidentified species, from a mouse nest.

SCAPHIDIIDAE

Scaphium castanipes Kby.—Taken in 1932.
Scaphisoma convexum Say?—Taken under bark.
Scaphisoma castaneum Mots.—Vidit H. C. Fall.
Scaphidiidae—An unidentified species.

SPHAERITIDAE

Sphaerites politus Mann.—Rare; taken beside Alwynne Creek, on bleaching bear bones.

HISTERIDAE

Hister umbilicatus Csy.—"Not quite typical," T. L. Casey said of one sent to him.

Hister umbrosus Csy.—Found about the stable. Fall called this a synonym of the above.
Hister immunis Er.—On sand near the river, 1934. Vidit H. C. Fall, but called *fidelis* Csy. by C. G. Siepmann.
Isolomalus mancus Csy.—In numbers under spruce bark, August, 1927.
Plegaderus sp.—Unknown species; vidit H. C. Fall. Very rare under hemlock bark on fallen trees from which bark is stripping.
Saprinus estriatus LeC.—Scarce, sand bank on slough near Skeena River, August, 1927.
Saprinus oregonensis LeC.
Saprinus bigemmeus LeC.—Mr. Frost wrote "Not quite like some from California sea coast."

LYCIDAE

Eros simplicipes Mann.—Frequent in the woods; May 25, 1929; June; det. E. C. Van Dyke.
Eros aurora Hbst.—Scarce; in the woods, June.
Eros nigripes Schaeff.—Scarce; in flight, first week of May; det. by C. Schaeffer and E. C. Van Dyke.
Eros thoracicus Rand.—Scarce; vidit H. C. Fall.
Plateros sp.—An unknown species.
Plateros californicus Van Dyke?—Vidit H. C. Fall.

LAMPYRIDAE

Lucidota corrusca Linn.—Common on flowers and herbage in the spring, and on wild everlasting flowers in the fall.
Lucidota lacustris LeC.—One of my specimens was compared with the type.

CANTHARIDAE

Podabrus piniphilus Esch.—Scarce; flying in May, June and July.
Podabrus comes LeC.
Silis pallida Mann.—June 14, 1920.
Malthodes sp.—May have been *humidus* Fender or *oregonus* Fender.

MELASIDAE

Melasis rufipennis Horn.—Rarely found, but was breeding in numbers in a confined spot in punky hemlock.
Isorhipis ruficornis Say.—"New record for the west." Taken in 1933.
Microrhagus pectinatus LeC.—"New record for the west."
Epiphanis cornutus Esch.

THROSCIDAE

Pactopus hornii LeC.—Scarce; flying; under moss in November, under cover in June; vidit H. C. Fall.
Throscus carinicollis Schaeff.—Det. H. C. Fall.

HETEROCERIDAE

Heterocerus brunneus Melsh.?—H. C. Fall's note: "runs to, but not the true one."

DASCILLIDAE

Macropogon piceus Horn?—"May be *dubius* Brown." Scarce; under dry moss flakes in May; on rocks of Little Canyon, Terrace.
Araeopidius monachus LeC.
Eucinetus terminalis LeC.—"New record for the west"; det. H. C. Fall, 1937.
Eucinetus sp.—An undescribed species; in Mr. C. A. Frost's collection.

HELODIDAE

Cyphon variabilis Thunb.
Cyphon concinnus LeC.

BYTURIDAE

Byturus bakeri Barber?—Vidit H. S. Barber; a bad pest on the wild blackcaps and raspberries.

DERMESTIDAE

Dermestes lardarius Linn.—A common pest; also taken on Thornhill Mountain.
Dermestes signatus LeC.—Scarce; a specimen compared with the type by C. A. Frost.
Dermestes talpinus Mann.
Orphilus subnitidus LeC.?
Orphilus aequalis Csy.?

BYRRHIDAE

Tylicus subcanus LeC.
Listemus acuminatus Mann. — By sifting moss.
Simplocaria tessellata LeC.
Cytilus alternatus Say.—Along roadsides, and on flats.
Byrrhus concolor Kby.—May, 1920.
Byrrhus difficilis Csy. — From Thornhill Mountain.
Byrrhus americanus LeC. — Found among grass roots, and on flats.
Byrrhus cyclophorus Kby.—From Thornhill Mountain.
Curimopsis setulosa Mann.—Vidit H. C. Fall.
Lioligus striolatus Csy.—Vidit H. C. Fall.

OSTOMIDAE

Ostoma pippingskoeldi Mann. — Rare; on pine, and from Thornhill Mountain.
Ostoma nigrina Csy.—December 10, 1920, on rotten wood, spruce and hemlock. Rare.
Ostoma columbiana Csy.

NITIDULIDAE

Cercus pennatus Murr. — Scarce on elder bark and bush; vidit Parsons.
Colopterus truncatus Rand.—Under edges of bark on freshly cut brush, June, 1931.
Nitidula nigra Schfr. — A subspecies of *rufipes* L.; teste Parsons.
Nitidula rufipes L.—Rare under edges of bark on freshly cut brush, June, 1931.
Omosita discoidea Fab.—Frequent on bones, March 13 to June; vidit C. T. Parsons.
Omosita colon L.
Epuraea planulata Er.—(All species of this genus vidit Parsons.)
Epuraea truncatella Mann.
Epuraea spp.—Two new species, one near *avara* Rand.
Epuraea terminalis Mann.
Epuraea adumbrata Mann.
Epuraea integra Horn.
Cryptarcha ampla Er.
Glischrochilus quadrisignatus Say. — Found on stale bread.

Glischrochilus vittatus Say. — Vidit C. T. Parsons.
Glischrochilus moratus Brown.—Vidit C. T. Parsons.

RHIZOPHAGIDAE

Rhizophagus sculpturatus Mann. — Vidit H. C. Fall.
Rhizophagus remotus Lec.—Rare; in sap on cedar stump.
Rhizophagus dimidiatus Mann.—Vidit H. C. Fall.
Rhizophagus brunneus Horn.—Vidit H. C. Fall.

MONOTOMIDAE

Monotoma picipes Herbst.—Taken on a barn window in July, 1931.

CUCUJIDAE

Oryzaephilus surinamensis L. — Beneath bark.
Cathartus sp.—An unknown species.
Cathartus advena Waltl.—Det. C. A. Frost.
Pediacus fuscus Er.
Pediacus depressus Hbst.—Rare, under hemlock bark.
Cucujus clavipes var. *puniceus* Mann.—Under bark.
Dendrophagus glaber LeC.—Frequent under loose bark.

EROTYLIDAE

Triplax thoracica Say.
Triplax californica LeC.—Vidit H. C. Fall.

DERODONTIDAE

Derodontus trisignatus Mann. — On white fungus in November.

CRYPTOPHAGIDAE

Salebius octodentatus Makl.
Cryptophagus lepidus Csy.—Taken by sifting.
Cryptophagus bidentatus Makl.
Cryptophagus cellaris Scop.—March 6, 1937; vidit A. S. Nicolay.
Cryptophagus sp.—An unknown species, on cabbage in the cellar, March 18, 1937.
Cryptophagus brevipilis Csy., or near.
Cryptophagus spp.—Two unknown species; vidit H. C. Fall. One occurred on cabbage in the cellar, March 8, 1937.
Cryptophagus saginatus Sturm., or near.
Henoticus serratus Gyll.
Caenoscelis ferruginea Sahlb.—Taken when sifting fermenting grass in June and July, 1931; vidit H. C. Fall.
Atomaria fallax Csy. (In the catalogue as *Anchicera fallax* Csy.—Eds.)
Atomaria sp.—An unknown species, taken in June, 1931.
Atomaria vespertina Makl.—Vidit H. C. Fall.
Anchicera n. sp.—Taken on February 4 from a squirrel dump. Now in C. A. Frost's collection.
Anchicera ephippiata Zimm.
Anchicera ochracea var. *pennsylvanica* Csy. —Compared with type by Nicolay.

MYCETOPHAGIDAE

Mycetophagus californicus Horn.—Taken in 1933, and on Thornhill Mountain.

LATHRIDIIDAE

Lathridius costicollis LeC.
Lathridius liratus LeC.
Lathridius lardarius Deg.—In flight at windows.
Coninomus constrictus Gyll.—November 3, 1923; also by sifting, June and July, 1931.
Enicmus tenuicornis LeC.
Enicmus protensicollis Mann.—On cabbage in cellar, March 17, 1934; vidit H. C. Fall.
Enicmus fictus Fall.—On cabbage in cellar, March 6, 1937; vidit H. C. Fall.
Enicmus cordatus Bel.—June, 1931, rare.
Enicmus minutus L.—Taken while sifting, June and July, 1931; also on cabbage in cellar, March 18, 1937; vidit H. C. Fall.
Enicmus suspectus Fall.—Sifted from fermenting grass, 1937.
Corticaria ferruginea Marsh.—Sifted from moss.
Corticaria sp.—An unknown species, but "not *similata* Gyll."; vidit H. C. Fall.
Corticaria dentigera LeC.—"*columbia* Fall a possibility"; vidit H. C. Fall.
Corticaria serrata Payk.
Melanophthalma sp.—An unidentified species.
Melanophthalma gibbosa Hbst.—A female.
Melanophthalma americana Mann.—Vidit H. C. Fall.
Melanophthalma cavicollis Mann.
Melanophthalma sp., near *distinguenda* Com.?

ENDOMYCHIDAE

Mycetina idahoensis Fall.—Taken from birch root, September, 1920, and June, 1931.

COCCINELLIDAE

Hyperaspis dissoluta Cr.—Rare; taken in May.
Microweisea misella LeC.?—On poplar.
Microweisea marginata LeC.—Taken in 1933 and 1934; det. H. C. Fall.
Scymnus n. spp.—Two new species.
Scymnus marginicollis Man..
Scymnus monticola Csy.—Taken while sifting, June and July, 1931; det. Wilson.
Scymnus sp. near *nanus* Csy.—Fall says eastern and western specimens are probably different.
Psyllobora viginti-maculata Say.
Hippodamia tredecimpunctata tibialis Say.—Scarce, on alder.
Hippodamia glacialis var. *lecontei* Muls.—On everlasting flowers.
Coccinella perplexa Muls.—On wild everlasting flowers.
Coccinella transversoguttata Fald.
Coccinella transversoguttata var. *nugatoria* Muls.
Coccinella transversoguttata var. *californica* Mann.
Coccinella monticola Muls.
Coccinella perplexa var. *juliana* Muls.
Adalia bipunctata var. *quadrimaculata* Scop. According to C. Schaeffer.
Adalia frigida Schn., near var. *disjuncta* Rand.
Adalia annectans Cr., var.
Neomysia subvittata Muls.

THE OCCURRENCE OF A HOLLYHOCK-SEED EATER, NOCTUELIA RUFOFASCIALIS, AT VERNON, BRITISH COLUMBIA
(Lepidoptera:Pyralidae)

HUGH B. LEECH
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Day after day in June, 1945, attractive red and white moths (Fig. 1, *Noctuelia rufofascialis* Stephens) were seen in my garden in Vernon. Some sat on the leaves of hollyhocks, others on the walls of adjacent buildings. They were not easily disturbed, and at rest held the wings in a typically pyralid manner, the whole insect having a triangular outline.

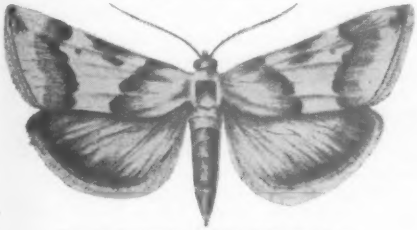

Fig. 1. **Noctuelia rufofascialis** Stephens.

No particular attention was paid to the moths, other than to admire the live specimens. By mid-July damage to the buds of hollyhocks (*Althaea rosea* Cav.) was obvious, and many of the seed heads showed an exudation of messy brown frass. On July 21 a number of infested buds and heads were examined. Each contained a fine caterpillar, white with wine-red bands. The almost continuous series from youngsters 4.5 mm. long to apparently mature larvae of 15 mm., suggested either an overlapping of broods or a long egg laying period.

A few heads were kept in a jar; from them two fully grown larvae emerged on July 26, and entered the damp soil provided. Three days later each had formed a silken cocoon, thin and somewhat irregular, but commodious. They pupated on August 2, and the moths emerged on the tenth, both females. On the same day a freshly transformed male was caught in the room, no doubt originating from the mass of flower and seed heads thrown into the waste-basket on July 21.

An adult was seen in the garden on August 12, and infested plants were noticed in other gardens in Vernon.

Either my collecting in 1945 was too thorough, or the following winter was unsuited to the species. During the period from May to August, 1946, not a single larva was found on the 20 or more hollyhock plants at my house. However, on September 8, Miss Glorianne Stromberg, a neighbour, found one mature larva in her garden, and kindly gave it to me. Mr. Ben Sugden sketched it the next day (Fig. 2).

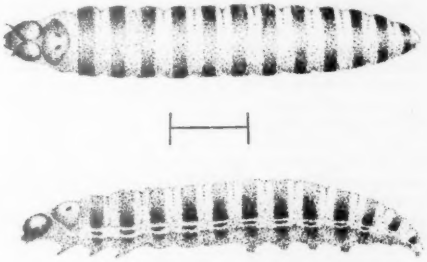

Fig. 2. Mature larva of **Noctuelia rufofascialis.**

In the hollyhock there is an almost regular progression of flowering, from the lower to the upper part of the main stem, and along each lateral branch. The first sign of the presence of caterpillars is that many of the young flower buds, those of about 10 mm. long, turn brown and are obviously dead. Small larvae can be found in most of them, feeding on the flower parts, especially near the bases. Later, by the time some buds are ready to open, they leave the dead ones, crawl under the bracts of fresh buds, and bore inwards. Here again they feed chiefly on the lower parts, indeed not always preventing the flowers from opening. Later still, many are found to have migrated to the seed heads, choosing those in which the bracts still tightly close the tops. There they tunnel in the green seeds, going completely around through the ring of them, hollowing the

head out and leaving only a tube. It is at this time, when the larvae are nearly mature, that the untidy blotches of faeces pushed from the entrance hole are most obvious.

With one exception, all the larvae seen had these habits. The individualist was in the open, during the day, feeding on the upper surface of a hollyhock leaf.

At Vernon, hollyhock was the only observed host. Heinrich (1921. Some Lepidoptera likely to be confused with the pink bollworm. Jour. Agric. Research **20** (11):807-836, pls. 93-109. *Noctuelia*, p. 829-830), recorded *N. rufofascialis* larvae from the pods of *Abutilon*, *Malvastrum*, *Wissadula*, and *Sida*, all malvaceous plants, at Brownsville, Texas. He reported that the larvae pupate in a thin cocoon, either in the empty seed pod or on the outside of the plant. He gave no figures of the insect, but it is possible he was dealing with the typical subspecies. All the specimens seen at Vernon were smaller and more brightly colored than the typical form, white and red instead of ash gray and reddish brown. The larval colors were almost exactly those of the adults.

ACKNOWLEDGMENTS—I am indebted to Dr. T. N. Freeman of Ottawa, Ont., for identifying the reared moths and citing Heinrich's paper; and to Mr. Ben Sugden of Armstrong, B.C., for the illustrations.

INTRODUCTION INTO BRITISH COLUMBIA OF TWO SPECIES OF JAPANESE CERAMBYCIDAE (Coleoptera).—Semanotus japonicus Lacordaire.—On April 3, 1917, the late Max H. Ruhmann collected a fine cerambycid at the outskirts of Vernon, B.C., on the flowers of a native shrub. This specimen was given to the late Ralph Hopping of Vernon, specialist on the Lepturini, who marked it as a new species but remained suspicious and did not describe it. While examining materials in the collections of the California Academy of Sciences recently, I recognized it as **S. japonicum.** Dr. E. C. Van Dyke tells me that in Japan the species breeds in a cupressine tree, **Cryptomeria japonica.** Since there are a number of Japanese farmers in the Vernon district, it is probable that the Ruhmann specimen emerged from furniture or crating lumber in some settler's effects.

Callidium rufipenne Motschulsky. Professor G. J. Spencer has kindly allowed me to record that in March, 1927, at Vancouver, B.C., he reared a series of small reddish cerambycid from some wood of Japanese origin. One of these beetles is now in the Linsley Gressitt collection in the California Academy of Sciences, and agrees perfectly with Japanese examples of **C. rufipenne.**—Hugh B. Leech, Calif. Acad. Sci., San Francisco, Calif.

NEW LITERATURE

CATALOGUE OF THE ODONATA OF CANADA, NEWFOUNDLAND AND ALASKA.—Francis C. Whitehouse. Reprinted from the Transactions of the Royal Canadian Institute, Vol. XXVII, No. 57, October, 1948.

* * *

In the author's words in his introduction, "this is a recapitulation of the recorded data on the odonate fauna occurring north of the international boundary; giving distribution; life zones within the territory covered; a list of the papers from which the records are taken, or are cited, in the text; flight periods, and selected references to descriptions and figures . . . for full bibliographies of species described prior to 1910, the reader is referred to the indispensable pages of Muttonski's Catalogue, to which the second numbers in this list refer." The first numbers are presumably the author's own, since he does not state their source.

One hundred and eighty-six species are recorded from Newfoundland and Labrador, every province and the Northwest Territories, to the Yukon and Alaska; British Columbia is represented as the Mainland, Vancouver Island and the Queen Charlotte Islands. The zones used are those of Merriam. "Capitals are used where the species finds optimum conditions in the zone indicated; lower case where the species extends only part way into the zone or is scarce there." This last feature constitutes a very useful item in any catalogue and so do the flight periods which have been taken from all records; where these "are too scant to represent the flight period fully, then first and last dates are given in suggestion that the imago life centres upon these."

The list of references includes over 156 titles, the latest distributional lists of the various specified areas being printed in heavy type. At the end of the catalogue is an index containing genera alphabetically arranged with species in each genus also alphabetically arranged.

Beyond a couple of trifling typographical errors, the compiling, editing and printing is perfect to the last punctuation mark, which is a real achievement in so detailed an undertaking. The paper is heavy and serviceable as it would need to be, or it would be worn to shreds in the hands of any working odonatist.

The author pays a glowing tribute to Dr. E. M. Walker, Dean of Canadian students of Dragon flies, whose past efforts constitute at least 80 percent of the material in this Catalogue. In the opinion of the reviewer, all entomologists in Canada owe an equally heavy debt of gratitude to Mr. Whitehouse for this extremely painstaking and inclusive piece of work.

—G. J. SPENCER

RECORD OF BEES FROM BRITISH COLUMBIA (Andrenidae)[1]

E. R. BUCKELL
Dominion Entomological Laboratory, Kamloops, B.C.

This list of 56 bees of the family Andrenidae has been compiled from a collection in the Field Crop Insect Laboratory, Kamloops, and material loaned by Professor G. J. Spencer of the University of British Columbia.

The Andrenidae, or acute-tongued burrowing bees, are solitary, constructing their burrows and cells in the ground. Although solitary, some species congregate in regular colonies. Sometimes a clay or silt cliff will contain innumerable burrows in close proximity. Their cells are stocked with nectar and pollen and these bees are beneficial plant pollinators. Willow blossoms are particularly attractive to Andrenidae, and a majority of the specimens collected in April and May by the author were taken visiting willow.

The names are arranged alphabetically and the collection points are listed, numbered, and placed on the accompanying map. Some localities have been heavily collected, while other areas, particularly in northern British Columbia, have had little or no attention, and the distribution record therefore, is far from complete.

The collectors are designated by initials only in the text, but a list of their names is included at the end of the paper.

The author wishes to thank Mr. P. H. Timberlake, Agricultural Experiment Station, University of California, Riverside, and Mr. U. N. Lanham, University of California, Berkeley, California, for the determination of material; and Professor G. J. Spencer for the loan of his collection.

Family ANDRENIDAE
Subfamily ANDRENINAE
Genus ANDRENA Fabricius

Andrena albihirta (Ashmead)
KASLO, April 7, 1907, 1♂; April 13, 1913, 1♂ (L.W.C.). PENTICTON, April 12, 2♀, 21, 1♂ 1♀, 30, 1♂, 1919; April 9, 6♂, 24, 18♀, 1929 (E.R.B.). VERNON, April 17, 1930, 2♀, April 5, 1939 1♀ (E.R.B.): April 9, 1925, 1♀ (M.H.R.). MINNIE LAKE, May 19, 1943, 1♀ (E.R.B.). CHILCOTIN, May 4, 1921, 1♂ (E.R.B.). VANCOUVER, March 22, 1♂, April 4, 1♂, 1903; March 25, 1906, 1♂ (R.C.T.).

Andrena amplificata Cockerell
PENTICTON, May 2, 1919, 1♀; April 24, 1929, 1♀ (E.R.B.): April 8, 1920, 1♀ (M.H.R.). KELOWNA, April 8, 1930, 1♂ (E.R.B.). VERNON, April 29, 1930, 3♀ (E.R.B.): April 20, 1920, 1♀ (R.C.T.). MINNIE LAKE, May 19, 1943, 2♀ (E.R.B.). DOUGLAS LAKE, April 23, 1930, 4♀ (E.R.B.). CHILCOTIN, June 15, 1920, 2♀; May 15, 1921, 1♀; May 28, 1929, 2♀ (E.R.B.).

Andrena bella Viereck
KASLO, April 16, 1907, 1♀ (L.W.C.).

Andrena binarea Viereck
VERNON, May 19, 1928, 1♀ (P.N.V.).

Andrena buckelli Viereck
PENTICTON, May 5, 1920, 1♂ (M.H.R.): April 24, 1929, 1♀ (E.R.B.). VERNON, May 1, 1929, 1♀; April 25, 1932, 1♀ (E.R.B.). KAMLOOPS, April 18, 1929, 1♀ (E.R.B.).

Andrena candida Smith
PENTICTON, April 9, 1♂; 24, 2♀, 1929 (E.R.B.). KAMLOOPS, April 18, 1929, 2♀ (E.R.B.).

Andrena chlosura Cockerell
NANAIMO, May 11, 1930, 1♀ (G.J.S.).

Andrena cleodora (Viereck)
KASLO, June 10, 1906, 1♀ (L.W.C.). PENTICTON, June 5, 1920, 1♀ (M.H.R.).

Andrena colletina Cockerell
CHILCOTIN, April 16, 1921, 2♀ (E.R.B.).

Andrena crataegi Robertson
PENTICTON, May 9, 1919, 1♀ (E.R.B.). VERNON, June 5, 1923, 2♀ (M.H.R.): May 16, 1927, 1♀ (D.G.G.): May 31, 1929, 1♂; April 29, 1930, 1♀ (E.R.B.). SALMON ARM, May 1, 1922, 2♂; July 4, 1943, 1♀ (E.R.B.).

Andrena cressonii Robertson. **subsp.**
VERNON, May 20, 1904, 1♂; May 16, 1920, 1♀ (E.P.V.): April 22, 1929, 1♂ (I.J.W.): May 1, 1929, 1♂ (E.R.B.). SALMON ARM, July 4, 1943, 6♀ (E.R.B.). VANCOUVER, May 23, 1930, 1♀ (H.B.L.).

Andrena epileuca Cockerell
KASLO, May 22, 1910, 1♀ (L.W.C.). CRESTON, May 17, 1926, 1♀ (A.A.D.). VERNON, June 1, 1913, 1♀ (E.P.V.). KAMLOOPS, June 13, 1943, 1♀ (E.R.B.). VANCOUVER, June 3, 1943, 1♀ (E.R.B.).

Andrena errans Smith
OLIVER, May 4, 1943, 1♀ (E.R.B.). PENTICTON, April 30, 1♀; Oct. 30, 1♀, 1920 (E.R.B.). VASEAUX LAKE, June 14, 1919, 1♀ (E.R.B.). NARAMATA, May 2, 1920, 1♂ (M.H.R.). VERNON, April 25, 1932, 1♂ (E.R.B.). SALMON ARM, May 14, 1929, 1♀ (H.B.L.). KAMLOOPS, June 13, 1943, 1♀ (E.R.B.). MINNIE LAKE, June 19, 1930, 1♀;

[1] Contribution No. 2566, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

May 19, 1943, 1♂ 1♀ (E.R.B.). CHILCOTIN, June 13, 1921, 3♀; May 28, 1♂ 6♀; June 14, 1♀, 1929; June 5, 1♂ 3♀, June 14, 1♀, 1930; April 28, 1944, 1♀ (E.R.B.). YALE, May 30, 1943, 1♀ (E.R.B.). MILNER, May 25, 1930, 1♀ (K.G.). VANCOUVER, May 22, 1930, 1♀ (G.J.S.): May 23, 1930, 1♀ (H.B.L.): June 3, 1943, 1♀ (E.R.B.). LADYSMITH, June 18, 1♀; June 30, 1♀, 1930 (G.C.C.).

Andrena erythrogaster (Ashmead)
CHILCOTIN, May 27, 1929, 8♀; May 3, 1930, 1♀ (E.R.B.). VERNON, April 18, 1929, 1♂ (I.J.W.).

Andrena extensa Viereck
VERNON, May 9, 1930, 2♀ (E.R.B.).

Andrena flavoclypeata Smith
VERNON, April 18, 1923, 1♂ (M.H.R.).

Andrena forbesii Robertson
KASLO, May 2, 1906, 1♂ (L.W.C.). KELOWNA, May 28, 1921, 1♀ (M.H.R.). VERNON, May 1, 1♂; June 4, 1♀, 1929 (E.R.B.).

Andrena sp. near **fulvinigra** Viereck & Cockerell
OKANAGAN FALLS, April 24, 1920, 1♀ (M.H.R.). PENTICTON, April 24, 1929, 1♀ (E.R.B.).

Andrena gibbiris (Viereck)
PENTICTON, April 11, 1919, 1♀; April 24, 1929, 1♀ (E.R.B.). KAMLOOPS, April 17, 1943, 1♀ (E.R.B.). CHILCOTIN, May 27, 1929, 1♀ (E.R.B.).

Andrena grandior Cockerell
CHILCOTIN, June 14, 1929, 1♀ (E.R.B.).

Andrena harveyi Viereck
VICTORIA, June 14, 1917, 1♀.

Andrena indecisa Cockerell
CRANBROOK, Aug. 15, 1928, 1♂ 3♀ (A.A.D.). INVERMERE, July 18, 1928, 1♀ (A.A.D.).

Andrena medionitens Cockerell
CHILCOTIN, June 13, 1929, 1♀ (E.R.B.).

Andrena melanochroa Cockerell
SALMON ARM, April 19, 1919, 1♂ (W.R.B.).

Andrena microchlora subalia Cockerell
OLIVER, May 4, 1943, 1♀ (E.R.B.). VERNON, April 26, 1920, 2♀ (R.C.T.): April 6, 1925, 1♀ (M.H.R.).

Andrena milwaukeensis Green
PENTICTON, May 9, 1919, 3♀ (E.R.B.).

Andrena miranda Smith
KASLO, May 14, 1906, 1♀ (L.W.C.). VERNON, May 1, 1929, 19♀ (E.R.B.): May 3, 1907, 1♀; May 6, 1913, 1♀ (E.P.V.); May 5, 1921, 1♀ (M.H.R.).

Andrena montrosensis Viereck & Cockerell
OKANAGAN FALLS, June 3, 1919, 1♀ (E.R.B.). PENTICTON, April 6, 1♀; May 15, 1♂; June 4, 1♀; June 5, 1♂, 1919 (E.R.B.). SUMMERLAND, June 4, 1919, 1♀ (E.R.B.). VERNON, May 1, 1908, 1♀ (E.P.V.): May 1, 1929, 1♂; May 9, 5♀; May 25, 1♀, 1930; May 17, 1937, 1♀ (E.R.B.). KAMLOOPS, June 13, 1943, 1♂ 7♀ (G.J.S.). CHILCOTIN, May 28, 1921, 1♀; June 13, 1929, 5♀ (E.R.B.). AGASSIZ, Sept. 11, 1925, 1♂ (G.J.S.).

Andrena nivalis Smith
KASLO, May 28, 1♂ 1♀; June 2, 1♀, 3, 1♀; July 17, 1♀, 1906 (W.L.C.). SAANICH, June 25, 1917, 2♀ (W.D.).

Andrena nubicula Smith
VERNON, Aug. 14, 1942, 1♀ (E.R.B.).

Andrena pallidifovea Viereck
VERNON, May 3, 1♂, July 20, 1♂, 1912 (E.P.V.). YALE, May 30, 1943, 1♀ (E.R.B.).

Andrena perarmata Cockerell
PENTICTON, April 24, 1929, 7♀ (E.R.B.). VERNON, March 31, 1930, 2♂ (E.R.B.).

Andrena placida Smith
KASLO, May 15, 1910, 1♀ (L.W.C.). OSOYOOS, May 8, 1928, 1♀ (E.R.B.). PENTICTON, April 11, 1919, 1♀ (E.R.B.). VERNON, May 3, 1907, 1♀; May 1, 1913, 1♀ (E.P.V.): April 22, 1929, 1♀ (I.J.W.): May 31, 1929, 1♀ (E.R.B.). CHILCOTIN, May 15, 1921, 1♀; May 24, 1929 (E.R.B.).

Andrena sp. near **politissima** Cockerell
PENTICTON, April 6-21, 1919, 4♂ 2♀ (E.R.B.). KELOWNA, April 8, 1930, 2♂ (E.R.B.). VERNON, April 17, 1929, 1♂ (I.J.W.); April 17, 1930, 1♀ (E.R.B.): April 13, 1907, 4♀ (E.P.V.). KAMLOOPS, April 18, 1929, 3♂ 2♀; April 17, 1943, 1♂ 1♀ (E.R.B.). NICOLA, May 3, 1943, 1♂ 2♀ (E.R.B.). MINNIE LAKE, May 19, 1943, 1♂ 1♀ (E.R.B.). CHILCOTIN, June 13, 1921, 1♀; May 27, 2♀; May 28, 1♀, 1929 (E.R.B.).

Andrena prunorum kincaidii Cockerell
KASLO, May 24, 1905, 1♂; June 5, 1♀, 10, 1♀, 30, 1♂, 1906 (L.W.C.). CRANBROOK, May 12, 1926, 1♀ (A.A.D.). OSOYOOS, May 8, 1928, 1♀ (E.R.B.). OLIVER, April 25, 2♂; May 4, 1♂, 1919 (E.R.B.). PENTICTON, April 11, 1♂, 17, 1♂; May 5, 1♂, 1919; April 24, 1929, 1♀ (E.R.B.). VERNON, June 15, 1918, 1♀, May 14, 1♂, June 6, 1♂, 1921; July 6, 1922, 1♀ (D.G.G.).; May 31, 2♂ 1♀; June 4, 3♂ 1♀, 1929; April 29, 1♀; May 9, 8♂, 1930 (E.R.B.). SALMON ARM, July 4, 1943, 3♀ (E.R.B.). KAMLOOPS, July 23, 1939, 1♂ (G.J.S.): April 17, 1943, 1♀ (E.R.B.). NICOLA, May 2, 1943, 1♂ (E.R.B.). WALHACHIN, July 10, 1♀, 16, 3♀, 23, 1♀, 1918 (E.R.B.). CHILCOTIN, April 16, 1921, 1♂; June 13, 1929, 1♀ (E.R.B.). AGASSIZ, June 6, 1939, 1♂ (A.B.D.). VANCOUVER, May 23, 1930, 1♀ (H.B.L.). VICTORIA, June 8, 1916, 1♀; June 17, 1917, 1♀ (R.C.T.): April 8, 1916, 1♀ (H.H.). SAANICH, June 15, 1917, 1♀ (W.D.).

Andrena pyrrhacita Cockerell
PENTICTON, April 4, 1♀, 8, 1♀, 12, 3♀, 1919 (E.R.B.). KAMLOOPS, April 17, 1943, 5♀ (E.R.B.). NICOLA, May 3, 1943, 4♀ (E.R.B.). CHILCOTIN, May 4, 1♀, 9, 3♀, 1921; May 27, 1929, 1♀ (E.R.B.).

Andrena regularis Cockerell
YALE, May 30, 1943, 1♀ (E.R.B.).

Andrena runcinatae Cockerell
KASLO, Aug. 19, 1906, 1♂ (L.W.C.). INVERMERE, July 18, 1928, 1♀ (A.A.D.).

Andrena saccata Viereck
KASLO, May 4, 1905, 1♀; May 6, 1♀, 10, 1♀, 30, 1♀; June 3, 1♀, 1906 (L.W.C.). PENTICTON, May 9, 1919, 1♀ (E.R.B.). CHILCOTIN, June 13, 1929, 1♀ (E.R.B.).

Andrena salicifloris Cockerell
KASLO, May 18, 1905, 1♂; May 5, 1908, 1♂; May 1, 1910, 1♂ (L.W.C.). VERNON, April 13, 1907 (E.P.V.): April 24, 1929, 1♀; April 17, 1930, 3♂ 2♀ (E.R.B.). SALMON ARM, April 26, 1943, 1♂ (E.R.B.).

Andrena salictaria Robertson
VERNON, April 4, 1904, 1♀ (E.P.V.): April 22, 1929, 1♀ (I.J.W.). DOUGLAS LAKE, April 23, 1930, 1♀ (E.R.B.).

Andrena seneciophila Cockerell
VERNON, May 20, 1904, 1♀ (E.P.V.); May 4, 1♀, 31, 1♀, 1929 (E.R.B.). SALMON ARM, May 26, 1943, 1♀ (E.R.B.). CHILCOTIN, May 28, 1921, 1♀; May 28, 1929, 1♀ (E.R.B.).

Andrena sladeni Viereck
PENTICTON, April 24, 1929, 3♀ (E.R.B.). VERNON, May 9, 1930, 2♀; May 17, 1937, 1♀ (E.R.B.).

Andrena sola Viereck
PENTICTON, April 24, 1929, 1♀ (E.R.B.).

Andrena striatifrons Cockerell
FAIRVIEW, May 4, 1919, 1♀ (E.R.B.). PENTICTON, April 7, 1♂, 17, 1♀, 21, 3♂, 23, 1♀; April 24, 1929, 1♀ (E.R.B.). KELOWNA, April 8, 1930, 1♂ (E.R.B.). VERNON, April 14, 1907, 1♂ (E.P.V.): April 17, 1929, 1♂ 1♀ (I.J.W.): April 17, 1930, 4♀ (E.R.B.). KAMLOOPS, April 18, 1929, 3♂ 2♀; April 17, 1943, 4♂ (E.R.B.). NICOLA, May 3, 1943, 2♂ 4♀ (E.R.B.). MINNIE LAKE, May 19, 1943, 1♂ 4♀ (E.R.B.). CHILCOTIN, May 9, 2♀, 13, 7♀, 1921; May 27, 1929, 3♀ (E.R.B.).

Andrena subaustralis Cockerell
KAMLOOPS, April 17, 1943, 1♀ (E.R.B.).

Andrena subtilis Smith
KASLO, May 6, 1910, 1♂ (L.W.C.). OLIVER, May 4, 1943, 3♂ 4♀ (E.R.B.). FAIRVIEW, May 18, 5♀, 19, 1♀, 1919 (E.R.B.): April 20, 1♀; May 18, 5♀, 1920 (M.H.R.). OKANAGAN FALLS, May 13, 1920, 1♀ (M.H.R.). KELOWNA, May 28, 1921, 2♀ (M.H.R.). PENTICTON, April 24, 1929, 1♂ (E.R.B.). VERNON, April 22, 1904, 1♂; 15, 1906, 3♂; May 3, 1907, 3♂; May 27, 1913, 2♂ (E.P.V.): April 26, 2♀: May 1, 1♂, 1920 (R.C.T.): April 14, 1921, 1♂; May 7, 1921, 1♂ (M.H.R.): April 18, 1♂, 22, 3♂, 24, 1♀ (I.J.W.): May 31, 3♀; June 4, 1♀, 1929 (E.R.B.). KAMLOOPS, June 13, 1943, 4♀ (G.J.S.). NICOLA, May 2, 1943, 2♀ (E.R.B.). LYTTON, May 30, 1943, 1♀ (E.R.B.). 100 MILE HOUSE, June 14, 1943, 1♀ (E.R.B.). VANCOUVER, June 3, 1943, 1♀ (E.R.B.).

Andrena surda Cockerell
INVERMERE, July 29, 1926, 1♀ (A.A.D.). OLIVER, July 10, 1929, 1♀ (E.R.B.).

Andrena swenki Viereck & Cockerell
VERNON, May 1, 1920, 1♀ (M.H.R.). CHILCOTIN, May 15, 1921, 1♀; June 13, 1929, 1♀ (E.R.B.).

Andrena transnigra Viereck
KASLO, June 5, 1906, 1♀ (L.W.C.). OLIVER, May 4, 1943, 1♀ (E.R.B.). KAMLOOPS, June 13, 1937, 1♀ (G.J.S.). MINNIE LAKE, May 19, 1943, 1♀ (E.R.B.). SALMON ARM, May 17, 1914, 1♀; April 11, 1915, 1♀ (W.R.B.). CHILCOTIN, June 13, 1921, 2♀; May 28, 1929, 4♀; June 5, 1930, 1♀ (E.R.B.).

Andrena trevoris Cockerell
DEPARTURE BAY, June 9, 1♂, 24, 1♂, 1925 (G.J.S.). NEWCASTLE IS., NANAIMO, June 1925, 1♂ (G.J.S.).

Andrena vicina Smith
KASLO, May 14, 1906, 1♂ (L.W.C.). FAIRVIEW, May 18, 1919, 3♀ (E.R.B.): May 19, 1920, 1♀ (M.H.R.). PENTICTON, April 6, 1919, 1♀ (E.R.B.): April 30, 1♂ 1♀; May 10, 1♂, 1920 (M.H.R.). KELOWNA, May 28, 1921, 1♀ (M.H.R.). VERNON, May 20, 1904, 1♀ (E.P.V.): June 14, 1921, 2♀; May 20, 1924, 1♀; May 1, 1925, 1♀ (M.H.R.): May 10, 1927, 1♂ (D.G.G.): May 31, 1929, 5♀ (E.R.B.). LYTTON, May 30, 1943, 15♀ (E.R.B.). SALMON ARM, May 3, 1♀, 14, 1♀, 1914 (W.R.B.). CHILCOTIN, May 24, 1929, 1♀ (E.R.B.). VANCOUVER, May 22, 1930, 6♀ (G.J.S.).

Andrena walleyi Cockerell
VERNON, May 12, 1920, 1♀ (M.H.R.). KAMLOOPS, June 13, 1943, 1♀ (G.J.S.). CHILCOTIN, June 13, 1929, 1♀ (E.R.B.).

Andrena washingtoni Cockerell, **var.**
KASLO, June 2, 1905, 1♀; May 17, 1906, 1♀ (L.W.C.). CHILCOTIN, May 28, 1♀; June 13, 1♀, 14, 1♀, 1929 (E.R.B.). ALEXIS CREEK, June 30, 1943, 1♀ (E.R.B.).

Genus **DIANDRENA** Cockerell

Diandrena nothoealaidis Cockerell
OLIVER, May 4, 1943, 1♀ (E.R.B.).

Genus **PARANDRENA** Robertson

Parandrena triangularis (Viereck)
KAMLOOPS, April 18, 1929, 1♀ (E.R.B.). NICOLA, May 2, 1943, 1♂ (E.R.B.).

LIST OF COLLECTORS

Mentioned by initials in the text.

A.A.D.—Dennys, A. A.
A.B.D.—Dickson, A. B.
E.P.V.—Venables, E. P.
E.R.B.—Buckell, E. R.
D.G.G.—Gillespie, D. G.
G.C.C.—Carl, G. C.
G.J.S.—Spencer, G. J.
H.B.L.—Leech, H. B.
I.J.W.—Ward, I. J.
K.G.—Graham, K.
L.W.C.—Cockle, L. W.
M.H.R.—Ruhmann, M. H.
P.N.V.—Vroom, P. N.
R.C.T.—Treherne, R. C.
W.D.—Downes, W.
W.R.B.—Buckell, W. R.

LIST OF LOCALITIES

Arranged alphabetically: the numbers corresponding to those on the accompanying map (V.I.: Vancouver Island).

1. Agassiz
2. Alexis Creek
3. Chilcotin
4. Cranbrook
5. Creston
6. Departure Bay, V.I.
7. Douglas Lake
8. Fairview
9. 100 Mile House
10. Invermere
11. Kamloops
12. Kaslo
13. Kelowna
14. Ladysmith
15. Lytton
16. Milner
17. Minnie Lake
18. Nanaimo, V.I.
19. Naramata
20. Newcastle Is., V.I.
21. Nicola
22. Okanagan Falls
23. Oliver
24. Osoyoos
25. Penticton
26. Saanich, V.I.
27. Salmon Arm
28. Summerland
29. Vancouver
30. Vaseux Lake
31. Vernon
32. Victoria
33. Walhachin
34. Yale

A FURTHER NOTE ON THE WHARF BORER, NACERDA MELANURA (L.) (Coleoptera: Oedemeridae). —In the Proceedings of our Society, Vol. 43, 1947, I recorded an unusual occurrence of **Nacerda melanura** (L.) in long-buried piling at Vancouver. At the time of investigating this infestation, in October, 1945, I saved a few pieces of riddled wood, apparently still infested, from the buried piles and placed them in a glass battery jar in my laboratory with coarse gravel all around them and wetted the whole mass with tap water so as to make it uniformly damp. The culture was examined in the autumn of 1946 and again in 1947 and, when fresh boring by a larva was noted, the wood was buried again in the damp gravel.

On March 10, 1948, the culture was examined again and one or two pieces of wood were broken open. In one of them occurred a fairly large tunnel containing an apparently healthy, full-grown larva and alongside of it, a female beetle which had died in the tunnel and was somewhat soft but intact enough to be successfully mounted on a card. The wood was reburied and will be examined again at intervals to see if the larva has transformed. Even under the harsh conditions of being removed from piling surround by brackish water and then buried in sand moistened with fresh water, one larva at least survived and completed its development, two years and five months after being first disturbed.—G. J. Spencer, Department of Zoology, University of British Columbia, Vancouver, B.C.

THE EFFECT OF DDT EMULSIONS ON TROUT FRY

L. C. CURTIS
Victoria, B.C.

During the past year, the staff of the Dominion Livestock Insect Laboratory at Kamloops achieved success in the control of *Simuliid* larvae in running water by the addition of a DDT emulsion. The terial used was a stock solution of 10% DDT, 10% Triton X100*, and 80% Xylene, which was added to the running water at a controlled rate. Effective control of the pest was obtained by a final dilution of one part DDT to 20,000,000 parts water.

As always in work of this nature, there arose the question of the effect of this treatment upon other fresh water life, particularly game fish, and this the writer attempted to determine during a brief visit to Kamloops.

The apparatus used consisted of a sheet metal trough, divided by a partition into two parallel channels, provided with a flow of running water from Cold Creek. At the upper end of the trough was situated the dropping apparatus which delivered the DDT solution beneath the surface of the water at a controlled rate. Below this, the water passed through a series of baffles to ensure thorough mixing of water and larvicide, while further down the trough, removable screens of fine mesh formed pens in which were held the fish under test. The reserve supply of fish was held in screened troughs in the nearby bed of the creek, which also served as the source of an unlimited supply of *Simuliid* larvae. The fish were one-inch trout fry, obtained from the Provincial Hatchery at Pinantan Lake.

TEST No. 1

A batch of 100 fish was penned in the trough, together with a stone covered with *Simuliid* larvae, and subjected to a flow of water containing one part DDT to 30,000,000 of water.

After twenty minutes, the larvae showed signs of distress, and in less than an hour they had all become detached from the substratum and carried away. The fish appeared to be unaffected, but were removed to a trough in the stream bed for observation. After twenty-four hours they still showed no sign of distress.

TEST No. 2

The strength of the emulsion was increased to one part DDT in 5,500,000 of water. All other conditions were as before. Ninety-five percent of the larvae became detached at the end of one hour, and 100 percent after 1½ hours. The fish remained lively, and showed no mortality after a period of 48 hours, when placed in the creek.

TEST No. 3

A one percent DDT emulsion was used, giving a final dilution of one part DDT in 2,700,000 of water. The effect upon the larvae was as before, and the fish showed no immediate effect. However, they showed a mortality of ten percent after 24 hours in clear water, and fifteen percent after 48 hours.

TEST No. 4

A dilution of one part DDT in 5,500,000 was maintained for three hours. At the end of that time, all the fish were active. After 24 hours, however, there was a mortality of 50 percent.

TEST No. 5

In this test, a 5 percent DDT emulsion was added, to bring about a concentration of one part DDT in 550,000 of water. This was sufficient to bring about a marked cloudiness. After fifteen minutes, fifty percent of the fish were in distress, and were held by the current against the lower net. After one hour, all the fish were rendered helpless. The emulsion was turned off, and clear water allowed to run over the fish. After thirty minutes, eigh-

*Triton X100 is an emulsifier, product of P. N. Soden & Co., Montreal and Toronto.

ty percent of them were again active, but at the end of 24 hours, all were dead.

TEST No. 6

The appearance of the fish used in the previous test, particularly during their temporary recovery, suggested mechanical clogging of the gills rather than DDT poisoning as the immediate cause of their stupefaction. To test this theory, equal batches of fry were placed in parellel troughs. Group A were treated with the same concentration of DDT as in Test No. 5, while Group B were subjected to a straight Xylene-Triton mixture without DDT, at the same rate. At the end of one hour both groups were rendered senseless, although the DDT emulsion appeared to act a little more slowly. After the dropping of the emulsion had been discontinued, Group A showed the more rapid recovery, eighty percent of them being active after thirty minutes, compared with sixty percent for Group B. Both groups were left in clear water overnight. After 24 hours, all of Group A were dead, while ninety percent of Group B were alive and active.

SUMMARY:

It has been found that DDT is effective for the control of *Simuliid* larvae at a concentration of one part in 20,000,000, and it was demonstrated that small trout are able to withstand the effect of a dosage nearly four times as strong without harmful effect and one nearly eight times as strong with but slight mortality.

A very heavy concentration of Xylene causes immediate distress, which is relieved by prompt return of clear water conditions. Actual DDT poisoning occures at higher concentrations, but is slower in its action than the Xylene.

In conclusion, I very much appreciate the courtesy of Mr. J. D. Gregson of the Dominion Livestock Insect Laboratory, Kamloops, who made available the facilities for carrying out this series of tests, and that of the officer in charge of the Pinantan hatchery, who supplied the trout fry used in the experiment.

In Memoriam

L. E. MARMONT, 1860-1949

Lindsay Edgar Marmont, a native of Gloucestershire, England, came to Canada when 20 years old, and farmed in Manitoba for a number of years.

In 1907 he came to British Columbia, taking up residence at Maillardville, serving that community as a justice of the peace, and reeve of Coquitlam for many years. He was a life member of the Westminster Club, and a prominent Elk.

As an entomologist, Marmont specialized in lepidoptera including the so-called "micros." He was a member of our parent body in Ontario around the turn of the century, and transferred his membership to this society upon its resuscitation in 1911, and took a keen and steady interest in its welfare, as can be realized by reading his "Presidential Addresses" in years gone by. President from 1921 until 1925, he filled the chair with distinction, dry humour, sound advice, and tolerance of other members' opinions.

He was the last of the old brigade—the Aurelians of B.C.—who did so much for the society in its early days, and the gap will not now be filled.

R. GLENDENNING, Agassiz, B.C.

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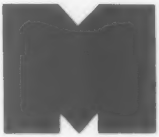

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